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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 688 - 1250.

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U. S. Department of Health, Education, and Welfare
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CATEGORY SCOPE NOTES

The categories used to organize the "NAPCA ABSTRACT BULLETIN" have been rearranged and changed slightly to permit more effective use. Scope notes for each category are given as a guide to our readers.

Emission Sources - Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

Control Methods - Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants from the air. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

Measurement Methods - Includes equipment as well as methods. Confined to development, testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

Air Quality Measurements - Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

Atmospheric Interactions - All chemical and physical phenomena occurring in the atmosphere. Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions fall under Basic Science and Technology.

Basic Science and Technology - General discussion or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes atmospheric photochemical studies and biochemical studies related to effects of air pollution.

Effects-Human Health - Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

Effects-Plants and Livestock - Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

Effects-Materials - Deterioration, corrosion, etc., of physical materials, buildings, and structures.

Economic Aspects - Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

Standards and Criteria - Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

Legal and Administrative - Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

Social Aspects - Sociological and psychological aspects such as social attitudes, public opinion studies, public relations, and public information.

General and Miscellaneous - Reviews of general problems, trends and background. Documents not assignable to other categories.

688 APTIC NUMBER 17334

Aliev, O. Z.
DATA FOR HYGIENIC ASSESSMENT OF THE ENVIRONMENTAL CONTAMINATION WITH HEXACHLORCYCLOHEXANE (HCCH) IN ITS USE IN AGRICULTURE. (Materialy k gigiyenicheskoy otsenke zagryazneniya vneshney sredy gekakhlortsiklogeksanom (GKhTsG) pri primenenii ego v sel'skom khozi'aystve). Text in Russian. Gigiena i Sanit., no. 12:12-16, 1969. 7 refs.

Contamination of the atmosphere and surface waters was studied in the vicinity of cotton fields treated with hexachlorcyclohexane (HCCH) by aircraft and ground spraying. The concentration of HCCH in the atmosphere from aircraft spraying varied from 0.3-0.006 mg/cu m and 0.58-0.03 mg/cu m from ground spraying. The concentration depended upon the time passed after treatment and the distance from the cotton fields. In the surface waters, HCCH was detected at concentrations of 0.09-0.25 mg/l after watering the cotton fields previously treated with HCCH. The threshold value of smell for the most sensitive person was 0.04 mg/cu m HCCH. The threshold value of reflex action, determined by electroencephalograms, was 0.03 mg/cu m HCCH. Inhalation of HCCH at a concentration of 0.03 and 0.04 mg/cu m had no effect on experimental animals. (Author abstract modified)

689 APTIC NUMBER 11700

Alkire, M. L.
AIR POLLUTION IN SOMERSET COUNTY MARYLAND. Maryland State Department of Health, Baltimore, Div. of Air Quality Control, 12p., Nov. 1968. 8 refs.

Somerset County, Md., with a population of 19,300, is characterized by either flat or slightly undulating topography. Ninety percent of the county's area if 20 ft or less above sea level, and 12% of the county is water. The county's air pollution problems are intense in small local areas and are associated with odors generated by the processing of seafood and agricultural products. Though accepted by local residents without complaint, the odors should be controlled in the interest of air quality. The prospects of a significant increase in pollution due to industrialization appear to be slight in the foreseeable future. Despite the presence of light winds and a stable temperature lapse rate which tend to increase their concentration, pollutants are in general quickly dispersed by vertical air currents. Diffusion is good over long periods of time.

690 APTIC NUMBER 18029

Arhippainen, Bengt and Bo Jungerstam
OPERATING EXPERIENCE OF BLACK LIQUOR EVAPORATION TO HIGH DRY SOLIDS CONTENT. Tappi, 52(6):1095-1099, June 1969. 10 refs.

Operating practice in most modern Scandinavian kraft mills includes evaporation of the black liquor to 60-65% dry solids content in multistage evaporators and direct firing of the strong liquor. In most cases, the selection of this system in preference to a direct-contact evaporator system can be justified by economical consideration alone, with no regard to air pollution. Operating experience with multistage evaporation plants operating at high dry solids content is reported. The heat transfer characteristics of black liquors are related to reported physical properties, and the importance of increasing boiling point rise with increasing dry solids content is pointed out. The scaling properties of black liquors at high dry solids content is related to their chemical properties. The importance of maintaining a low temperature in the high dry solids effect, a reasonable content of residual alkali, and low contents of sodium sulfate, carbonate, and fiber in the black liquor, efficient soap separation, and high white liquor clarity, in order to limit scaling, is stressed. It is indicated that the optimum product dry solids content may be higher than the 62-63% presently achieved with natural circulation evaporators, because of favorable secondary effects in the recovery boiler. Some Scandinavian mills use forced circulation in the high dry solids effect, whereby 65-67% dry solids content can be reached. The use of forced circulation in the high dry solids effect is not always justifiable in Scandinavia, but it is assumed that forced circulation should be a first choice in many areas with lower power costs. (Author's Abstract)

691 APTIC NUMBER 11619

Auckland Air Pollution Research Committee, New Zealand
NINTH ANNUAL REPORT OF THE AUCKLAND AIR POLLUTION RESEARCH COMMITTEE FOR YEAR ENDING 31 MARCH 1968. 72p., 1968. 27 refs.

Data are presented pertaining to the pattern of fuel use, future sources of electrical energy, and meteorological conditions in the Auckland area. The relative importance of the different fuels used for domestic, commercial, industrial, and transportation purposes is considered, and an attempt is made to evaluate the probable rates of emission from their combustion. Seasonal and regional variations in the use of fuels are noted. In the case of domestic fuels, there are also daily variations. Maximum emissions of smoke and other pollutants from domestic sources occur during the early morning and late afternoon. These emissions often coincide with periods of little or no air movement. However, the use of coal, wood, coke, and briquettes is declining in the Auckland area and more reliance is being placed on cleaner methods of heating, such as electric heating appliances and oil-fired central heating units. Upward trends in the production of sulfur dioxide and nitrogen oxides may be offset to some extent by increasing electricity consumption. Sulfur dioxide levels could be reduced by fuel desulfurization processes. Another factor affecting Auckland's air pollution is the advent of natural gas. Increased usage of this fuel will assist in reducing levels of all pollutants.

692 APTIC NUMBER 11968

Bachl, Herbert and Franz Maikranz
FIRING REFUSE IN A HIGH-PRESSURE STEAM PLANT. (Erfahrungen mit der Verfeuerung von Muell in einem Hochdruck-Dampfkraftwerk). Energie (Munich), 17(8):317-326, 1965. Translated from German. 26p.

The problem of refuse incineration and refuse utilization was solved in a new way in the Nord power station of the Munich municipal power system. Refuse is used as a fully equivalent fuel in two high-pressure superheated steam boilers. The boilers are designed for firing coal and refuse alone or in combination. When coal and refuse are combined, 60% of the full-load heat is supplied by coal and 40% by refuse. When only refuse is fired, reduced steam pressures and steam temperatures are used without generation of electricity. The installation can also be converted to gas firing or oil firing. In the pulverized coal-firing boilers, refuse is burned on Martin refuse grates located under the refuse flue gas pass. At full load, a boiler efficiency 92.5% is guaranteed for all-coal firing; efficiency for combined operations is 85%. The annual capacity of the boilers is expected to be about 420,000 t/yr of refuse. At an average refuse heating value of about 1200 kcal/kg, about 500,000 Gcal/hr is supplied the power station by refuse. In coming years, the plant is expected to meet about 10% of Munich's power requirements. The boilers and auxiliary plant equipment are described in detail.

693 APTIC NUMBER 11625

Black, Ralph J., Anton J. Muhich, Albert J. Klee, H. Lanier Hickman, Jr., and Richard D. Vaughan
THE NATIONAL SOLID WASTES SURVEY. (AN INTERIM REPORT). Preprint, American Public Works Assoc., Chicago, Ill., Inst. of Solid Wastes, 5 p., 1968. 7 refs. (Presented at the American Public Works Association, Institute for Solid Wastes, Annual Meeting, Miami Beach, Fla., Oct. 24, 1968.)

The interim report consists of five papers, each presented at the 1968 Annual Meeting of the Institute for Solid Wastes: the foundation provided by the new national data; sample representatives and community data; the role of facilities and land disposal sites; the challenge that the national survey presents; and national solid wastes survey, report and interpretation. The information presented is preliminary in that it represents partial fulfillment of a national solid waste survey scheduled for completion in 1971. The average amount of solid waste actually collected in this country is 5.3 lbs/person/day, or more than 190 million tons/yr. Approximately 10-15% of household and commercial wastes are collected or transported by the individual generating the waste; 30-40% of the industrial wastes are also self-collected and transported. Estimates for 1967 indicate that over 10 lbs of household, commercial, and industrial wastes are being generated in this country for every man, woman, and child, totalling over 360 million tons/yr. To these figures must be added over 550 million tons/yr of agricultural waste and crop residues, approximately 1.5 billion tons/yr of animal wastes, and over 1.1 billion tons of mineral wastes. Altogether, over 3.5 billion tons of solid wastes are generated in this nation every year. The annual expenditure to handle and dispose of the household, commercial, municipal, and industrial solid waste material is estimated at $4.5 billion/yr. Approximately $150 million is required to construct new incinerators for replacement of existing inadequate incinerators and conical burners. An additional $75 million is required for air pollution control equipment to upgrade or replace existing inadequate incinerators.

694 APTIC NUMBER 11603

Bush, A., J. Burke, B. Carlson, and S. Ross
EFFECT ON THE ATMOSPHERE WHEN AUTOMOTIVE EXHAUST EMISSIONS ARE CONTROLLED. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 39-59, Sept. 1968.

'Clean air' criteria were applied to investigate the atmospheric effects of exhausts from vehicles driven on different driving patterns (freeway, commuter, city driving) and the effects of different control devices on emissions during these driving cycles. A transparent polyethylene 6000-cu ft reaction chamber utilizing natural solar radiation and equipped with a filtration temperature, and humidity control systems was used as a miniature Los Angeles basin in which variables could be controlled and effects tested. To supply the exhaust, vehicles were run on a magnetic tape-controlled chassis dynamometer. Experimental results are given for new and older cars with respect to nitrogen oxides, carbon monoxide, ozone, and hydrocarbons. Results indicate that newer vehicles have not brought about an improvement in the condition of the atmosphere and have increased atmospheric NO levels. Control devices are designed to meet official tests, such as the 7-mode cycle, but meeting the test does not guarantee clean air. The Kopa recirculation device is under investigation and is being tested for effectiveness under all types of driving conditions.

695 APTIC NUMBER 12448

California Motor Vehicle Pollution Control Board
EFFECTIVENESS OF EXHAUST CONTROLS IN PUBLIC USE. 11..., 1967.

Emission test data on 1966 model cars (Ford, GM, and Chrysler) with exhaust controls were statistically analyzed for trends in hydrocarbon distribution and hot-start emissions. The controlled vehicles achieved a 70% reduction in total emissions. However, emissions tended to exceed the hot-start standards of 250 ppm hydrocarbons and 1.22% carbon monoxide before 12,000 miles and, with the exception of the Fords, to show significant deterioration beyond the mileage normally associated with deposit buildup in combustion chambers. Data is also presented on spark timing and idle speed settings of 1966 models. They show that large percentages of the cars are outside specified spark timing tolerances when new and that the percentages increase significantly with time and mileage. These subsequent maladjustments have a large effect on driveability and customer satisfaction. Car companies must multiply their efforts in the following fields: improvement of basic performance ability of exhaust systems; adjustment to factory specifications at the factory; actual performance of proper adjustments by dealer service personnel as part of their training; and development of fixed or limited range adjustments.

696 APTIC NUMBER 18053

NO LEAD, LESS RVP COMING IN GASOLINE. Can. Chem. Process., 53(3): 47-50, March 1969.

The problems of air pollution control must be faced by automotive engineers and gasoline refiners. If the motor vehicle industry staves off pressure to do away with pollution-causing power units, it will only do so as a result of measures that remove at least 80% or more of the noxious fumes. This may force sacrifices in fuel economy since most anti-pollution devices appear to reduce the mileage per gallon. It could also put the manufacturers of lead additives out of business and complicate the task of refiners seeking to achieve maximum octane ratings at the lowest cost. With the many unknowns in the equation, it is difficult to assess how the refiners will respond to the public demand for pollution control. Although many technological tools are available, use of them will require a readjustment in the use of the hydrocarbon fractions. Two approaches under study that may minimize the loss in fuel economy are discussed.

697 APTIC NUMBER 18052

Chironis, Nicholas P.
SMALL STEAM ENGINE VIES FOR CARS, POWER PACKAGES. Prod. Eng., 40(7):100-102, April 7, 1969.

Many engineers feel the steam engine is a potential replacement for the air-polluting internal combustion engine. It is relatively simple, silent, efficient, produces fewer pollutants, and it can use cheaper, safer fuels than can other engines. A V-8 steam engine that weighs less than 40 lb and is so simple it needs no castings is powering motorboats and being adapted for use in medium-sized vehicles. Moreover the engine is proving remarkably successful as the power source for compact, steam-powered, total-energy modules. The total-energy package is described in some detail with flow sheet and phase diagram.

698 APTIC NUMBER 17357

Chovin, Paul
CHEMICAL POLLUTION OF THE ATMOSPHERE. (La pollution chimique de l'atmosphere). Text in French. Sci. Progr. Decour., no. 3417; 35-40, Jan. 1970. 6 refs.

A systematic general review is presented of the origin and nature of chemical pollutants of the atmosphere, of their action on living beings, and of the battle against atmospheric pollution. Principle sources of pollutants are the industrial and domestic heating plants. In regions of high industry concentration, steel plants and chemical plants emit specific pollutants. Principal pollutants are sulfur dioxide, sulfur trioxide, carbon dioxide, carbon monoxide, nitric oxide, nitrogen dioxide, fluorine, and light and heavy hydrocarbons. Sulfur dioxide is a byproduct of combustion of fossil fuels containing, on the average, 3% S (coal in France has about 1% S, some foreign coals have up to 6% S). Estimated emission of S is as follows: in France, 2 million tons, in England, 5 million tons, and in the U. S., 40 million tons a S per year. Sulfur trioxide is largely due to oxidation of SO2; it combines with moisture to form H2SO4 which is very noxious. Rain has a beneficial effect by scrubbing the polluted air. Carbon dioxide is the product of complete combustion of C; 500 to 600 million tons are estimated to be emitted in England. Carbon monoxide is the product of incomplete combustion, rather rare in industry, but invariably present in automobile exhaust gas. Nitric oxide and NO2 are present in low concentrations, but a complex photochemical reaction produces one type of smog, ozone, and new chemical compounds such as peracetylnitrate, CH3-CO-OO-NO2, which has a very strong physiological effect. Fluorine and its compounds, such as HF, are emitted by fertilizer and by aluminum plants. Dusts are emitted by industrial and domestic heating plants. The action of air pollutants on bronchi and lungs is disucssed at length. The reaction of the cardio-vascular system and the incidence of broncho-pulmonary cancer are also considered. In the battle against atmospheric pollution laws alone are insufficient, means of measuring emissions, and enforcing compliance are essential.

699 APTIC NUMBER 11768

Christopher, H. A., C. E. Kent, G. W. Dunlap, B. H. Guess, and G. E. Moore
PROPULSION BATTERY SYSTEMS FOR ELECTRIC VEHICLES. (FINAL REPORT). General Electric Research Lab., Schenectady, N. Y., International Lead Zinc Research Organization, Inc., Proj. LE 129, E-S-67-1173, 71p., Oct. 1967. 13 refs.

Electric vehicle systems are analyzed with particular emphasis on the potential applications for a lead-acid battery system. Computer programs are established, based upon vehicle requirements for power to determine the battery requirements. Various classes of vehicles were studied and range capabilities were determined for a variety of speeds and stop frequencies. Lead-acid batteries can be used to power a 1500-pound vehicle but do not permit satisfactory operation for vehicles weighing more than 2500 pounds. Engine-generator sets producing low pollutant levels are feasible. Engine-generator/lead-acid battery hybrid power system vehicles represent an opportunity for use in buses and urban autos without producing high pollutant levels. Dual battery hybrids have restricted utility in automobile power systems. Data relating cycle life to pulse discharges of lead-acid batteries are lacking. Improvement of the charge acceptance at high rates for the lead-acid battery would result in substantial performance improvements for hybrid systems and for the regenerative braking systems. Although regenerative braking is desirable from a safety point of view, the increase in vehicle range attributable to this feature is very small. Improvement of the energy content of the lead-acid battery was less important than the charge rate increase. It was concluded that vehicles weighing more than 2500 pounds will not be powered by a single battery of less than 100 watt-hours per pound. Detailed data on the effect of high rate deep discharges of lead-acid batteries on their cycle life were not available.

700 APTIC NUMBER 11988

Csarko, Vojtech and Vladislav Kapalin
OCCURRENCE OF ARSENIC EXHALATIONS IN THE COMBUSTION OF YOUNGER

COAL. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 159-170.

The average arsenic values for Czechoslovak coal are 655-875 g/t coal. In contrast, the arsenic content of the Novaky coal burned by a power plant near Zemianske Kostol is 1.166-1.343 g/t coal. The majority of the arsenic compounds are bound to fly ash, 20% of which escapes to the atmosphere. The remainder of the fly ash is absorbed by electrostatic precipitators. The maximum measured concentration of arsenic in the atmosphere around the plant is 0.069 mg/cu m. One km to the south of the plant, arsenic values in surface soil are 163-372 kg/soil. Arsenic concentrations in well water are 0.023-1.11 per one l of water. Plant bacteria in the soil have decreased, while the percentage of sporulating microbes has increased. The average arsenic content in river water is 0.023 mg/l; in periods of drought, it increases as much as 10 times. Significant differences are noted in the hemoglobin levels in children in the area as compared to the Slovak average. Acute respiratory disease and pyodermias are frequent among workers in the region.

701 APTIC NUMBER 16877

Commins, B. T.
FORMATION OF POLYCYCLIC AROMATIC HYDROCARBONS DURING PYROLYSIS AND COMBUSTION OF HYDROCARBONS. Atmos. Environ., 3(5):565-572, Sept. 1969. 23 refs.

The effect of variations in equivalence ratio (mixture strength) of a combination of fuel vapor and air on the production of polycyclic aromatic hydrocarbons is discussed. The effect of temperature alone on the production of hydrocarbons is studied by pyrolysing acetylene in the absence of air at temperatures in the range 550-1000 C. The ratios of each polycyclic hydrocarbon to 1:2-benzpyrene have been calculated and it is found that certain ratios vary markedly when the combustion conditions are altered. An example is given to show how the proportion of 3:4-benzpyrene contributed to town air by motor vehicles can be calculated in a mixed sample of smoke from motor vehicles and the burning of coal. (Author's Abstract)

702 APTIC NUMBER 18027

Cornish, Herbert H. and Ellen L. Abar
TOXICITY OF PYROLYSIS PRODUCTS OF VINYL PLASTICS. Arch. Environ. Health, 19(1):15-21, July 1969. 12 refs.

Polyvinyl chloride polymers and formulations were pyrolyzed in a stream of air by gradually raising the temperature from ambient to approximately 600 C. The pyrolysis air stream was diluted with twice its volume of room air, and rats were exposed to it. Exposure to an air stream containing the pyrolyzed products of 1 to 2 gm of polyvinyl chloride polymer resulted in the death of 50 percent of the animals. Most deaths were due to carbon monoxide (CO), and carboxyhemoglobin (COHb) levels correlated well with the amount of plastic pyrolyzed. Little histological evidence of lung damage was evident. When oxygen (O2) was added to the air stream to prevent deaths from CO, pulmonary edema and interstitial hemorrhage developed. The lungs of some animals exposed to high levels of pyrolysis products of vinyl chloride-vinyl acetate copolymer also showed focal edema and intra-alveolar hemorrhage. Polyvinyl chloride formulations, containing additives and inert materials, were in general less toxic per gram of sample pyrolyzed. (Author's Abstract)

703 APTIC NUMBER 17398

Council for Air Pollution Countermeasure, Kashima (Japan)
REPORT ON WHOLE INVESTIGATION OF AIR POLLUTION CONTROL MEANS IN KASHIMA AREA, IBARAGI PREFECTURE. (Taikiosen boshitaisaku chosahokokusho. Ibaragiken Kashimachiku). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(1):32-38, Jan. 15, 1970.

A field survey was conducted to determine the extent of pollution to be expected following the completion of large-scale industrial projects in the Kashima district of Ibaragi prefecture. The estimated production capacities in the district is as follows: petrochemical plants, 600,000 BSD; thermal power plant, 4,800,000 kw; ethylene products, 1,000,000 t/year; and iron-steel products, 12,000,000 t/year. Each of the industries surveyed has 28 stack plants, 182 boilers and furnaces, and 153 chimneys. The plants consume annually an estimated 7,600,000 kl of heavy oil, which constitutes 75% of the fuel used. The estimated quantity of sulfur dioxide emissions is 20,000 cu nm 3/h, which is lower than that predicted for gross heavy oil burning. The average sulfur content of heavy oil is 1.8%, but if subsidiary fuels, like by-product gas, and oil are included together, the figure decreases by 1.4%. Nearly 86% of the total SO2 emissions from chimneys are discharged from chimneys more than 100 m in height. It is noted that smoke emissions can be controlled by supplying electric power and steam from a central power-station. Factors influencing the dispersion of pollutants, such as geographical features, weather conditions, temperature variation, atmospheric inversion layers, and particularly the occurrence of up- and down-air streams, are being investigated.

704 APTIC NUMBER 18009

Darnay, Arsen, Jr.
THROWAWAY PACKAGES--A MIXED BLESSING. Environ. Sci. Technol., 3(4):328-333, April 1969.

Solid wastes pose many problems to the affluent society. Waste collection, waste processing, aesthetic blight from littering, soil and groundwater pollution from decomposition of organics, air pollution from waste combustion, and loss of potentially valuable raw materials are aspects of the subject which are discussed. Each of these subject areas is considered from the point of view of the basic problem, the contribution of disposable packaging to the problem, and possible approaches to solution of the problem.

705 APTIC NUMBER 16888

Day, C. E., Jr.
HOW WE SPECIFY FUELS FOR OUR PLANTS. Combustion, 40(10):22-25, April 1969.

Specifying of fuels and of fuel characteristics, when done cooperatively by engineers and purchasing agents, can be a useful tool for promoting combustion reliability and in obtaining fuel economics. This paper describes how one large industrial fuel consumer specifies fuels to these ends. (Author's Abstract)

706 APTIC NUMBER 17339

Dimitriades, Basil, B. H. Eccleston, and R. W. Hurn
AN EVALUATION OF THE FUEL FACTOR THROUGH DIRECT MEASUREMENT OF PHOTOCHEMICAL REACTIVITY OF EMISSIONS. J. Air Pollution Control Assoc., 20(3):150-160, March 1970. 11 refs.

Photochemical reactivities of vehicular emissions are reliably measured in laboratory experiments in which smog manifestations are observed directly. Results of the direct smog-chamber measurements revealed that the photochemical behavior of emissions may differ significantly from the behavior that is predicated from the exhaust composition using reactivity scales. The concept of direct measurement of reactivity was applied to determine differences in characteristics of emissions from 20 passenger vehicles, each tested using 10 different fuels. The primary objective of the fuel study was to assess the over-all effect on vehicle emissions of fuel modifications designed to reduce the photochemical pollution associated with automotive evaporative losses. A similar, brief, comparative study of leaded and nonleaded fuels was also made. Reducing volatility was found to reduce the over-all smog potential of vehicle emissions but involved some penalty by way of increased exhaust emissions. Replacing light olefin with the corresponding paraffin also reduced over-all smog potential and in this case exhaust reactivity was not affected. In general greater smog potential was found to be associated with prototype nonleaded fuels than with leaded fuels typical of products currently marketed. (Author abstract modified)

707 APTIC NUMBER 12119

Dooley, James L. and Allan F. Bell
DESCRIPTION OF A MODERN AUTOMOTIVE STEAM POWERPLANT. Preprint, Society of Automotive Engineers, Inc., New York, 14p., 1962. (Presented at the Society of Automotive Engineers, Los Angeles Section Meeting, Jan. 22, 1962, Paper S338.)

A program to apply modern materials and engineering techniques to the development of the Paxton steam car is reviewed; the development program itself ended in 1954. The technical features of early steam cars are outlined, and the specifications, working cycle, and design features of the Paxton automotive steam powerplant are described and diagrammed in detail. The advantages of the system are enumerated and compared with the internal combustion engine; these advantages include long burning time and close control of the combustion process. No tetraethyl lead is required in the fuel; in addition, excess oxygen is always present, so high-combustion efficiency is attainable and no smog or noxious fumes are produced. The furnace can be operated indoors without danger, as no carbon monoxide is emitted. Because the combustion process is separated from the operating fluid, no contamination occurs from sulfurous or obnoxious combustion products.

708 APTIC NUMBER 11982

Dousa, Karel
THE EFFECT OF HYDRAULIC FLY-ASH HANDLING ON LIVING. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 71-82.

Slag and fly ash are usually conveyed to an excavator tank from which they are flushed by sluice water through pumps and pipelines to dumping areas in the hydraulic method of handling fly ash produced by the combustion of solid fuels. The stored slag-fly ash material endangers human health by creating excessive dust, affecting the physical-chemical properties of surface and underground water, and introducing noxious elements to the air. Crops, animals, and the forest economy are similarly affected. These negative effects are partly attributed to the composition of the waste water and water levels inadequate to secure the necessary sedimentation of the slag-fly ash mixture. Sedimentation and aspiration methods are proposed to reduce the dust nuisance caused by the dumps along with modifications in the distribution of transport waters and their mixtures.

709 APTIC NUMBER 12404

Dugas, Doris J.
INCREASE OF EXCHANGEABLE CARBON IN THE EARTH'S RESERVOIRS FROM COMBUSTION OF FOSSIL FUELS. Preprint, Rand Corp., Santa Monica., Calif., P-3990, 24p., Dec. 1968. 11 refs.
CFSTI, DDC: AD 680747

The distribution of excess carbon dioxide produced during and after the consumption of all fossil fuel was determined with the aid of a four-reservoir model of carbon exchange as developed previously for carbon 14. From estimates of the total hydrocarbon fuel resources originally on earth, it was calculated that about 3000 billion tons of carbon ultimately may be released to the atmosphere from this source. At a moderate consumption rate, this fuel supply will be consumed within 200 years and, according to the model, the atmospheric carbon dioxide concentration will reach a maximum value of twice its normal (pre-1900) concentration before declining to a new equilibrium level of about 8% above the normal. Carbon excess in the surface layers of the ocean reaches a peak a few years later than the atmosphere and retains somewhat less of the excess carbon at equilibrium, while the deep sea eventually absorbs over 90% of the excess carbon released by fossil fuel consumption. The results are highly sensitive to the assumptions as to future fossil fuel consumption rates, but the atmospheric carbon concentration is not critically affected by the amount of direct exchange between the atmosphere and deep sea. (Author abstract modified)

710 APTIC NUMBER 18023

ZINC-AIR BATTERY SYSTEM RESEARCH PROJECT (BP64). EEI Bull., 37(5): 155-158, 163, May 1969.

The zinc-air battery which is now being developed has potential as a compact and light weight electrical energy storage system to replace the internal combustion engine for propulsion of various types of vehicles. Inexpensive operation, smooth acceleration, long life, and reduced air pollution are among the anticipated features of the zinc-air battery system. The energy in the zinc-air battery is derived from the process of converting zinc to zinc oxide. The zinc is stored in the battery by electrochemically plating the metal on thin support plates to form the zinc electrode. Oxygen comes either from air or from pressurized storage through porous nickel electrodes and potassium hydroxide in water is used as the electrolyte. A change in the development program is directed toward refinement of an externally rechargeable mode of operation in order to advance the program more rapidly.

711 APTIC NUMBER 17365

Ellen, Richard P.
OUR AUTOMOBILE: A CONTRIBUTION TO AIR POLLUTION. Air Pollution Control Assoc, Pittsburgh, Proc. Air Pollution Control Assoc. Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Philadelphia, Pa., 1969, p. 44-58. 24 refs. (March 21.)

The harmful effects of pollutants on human health and current concepts of automotive emission control are considered. Systems to reduce engine exhausts, carburetor, and fuel tank emissions are reviewed. Attention is also called to the ability of fuel injection engines to cut hydrocarbon and carbon monoxide emissions in half and to the use of alternate fuels as a possible remedy for the exhaust emission problem. Federal and California emission standards for automobiles are compared. Human health responses are considered with respect to the following pollutants: carbon monoxide, nitrogen oxides, oxidants, and lead compounds.

712 APTIC NUMBER 16890

Ellis, William H., Zoltan Saary, and David G. Lesnini
FORMULATION OF EXEMPT REPLACEMENTS FOR AROMATIC SOLVENTS. J. Paint Technol., 41(531):249-258, April 1969. 16 refs.

Air pollution legislation in California, in effect, requires that aromatic solvents be replaced with exempt materials. Oxygenated solvents in combination with low-aromatic hydrocarbon thinners are being used to replace the restricted aromatics. Solvency and evaporation rate are the two key performance factors that must be considered in developing replacement solvents. Cost, odor, and toxicity are also important. The use and relationship of various tools available for developing suitable aromatic replacements are described for the guidance of the formulator. Data are given for illustration. A practical approach to reformulation is outlined. (Author's Abstract)

713 APTIC NUMBER 12285

Ernst and Ernst, Washington, D. C.

THE FUEL OF FIFTY CITIES. NAPCA Contract PH 86-68-37, 95p., Nov. 1968. 12 refs.

The detailed results of a survey of coal, oil, and gas prices and sulfur content in 50 U. S. metropolitan areas are presented. The survey was taken from March to June 1968 by telephone, and results are estimates of various grades of fuels correlated with sulfur and ash content; prices are shown in dollars per million British Thermal Units. Prices vary with the quantity purchased. Four classes of users are defined in terms of the quantities of each type of fuel consumed: domestic, commercial, and industrial users and power plants. A methodology is presented for calculating the order-of-magnitude costs of reducing sulfur oxide and particulate emissions by changing fuels in a specific stationary combustion source. Two types of fuel changes are considered: fuel substitution and fuel switching. This method permits the costs of air pollution abatement by fuel change to be estimated rapidly for the 50 cities of the survey.

714 APTIC NUMBER 12588

Eyzat, P. and J. C. Guibet
A NEW LOOK AT NITROGEN OXIDES FORMATION IN INTERNAL COMBUSTION ENGINES. Preprint, Society of Automotive Engineers, Inc., New York, 18p., 1968. 29 refs. (Presented at the Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1968, paper 680124.)

The theory presented allows forecasting of nitric oxide emissions in spark ignition engines. Following preliminary review of possibilities of obtaining the equilibrium state, as well as the basic concept of medium temperatures, the use of kinetic calculations for estimating the NO content of both unburned and burned mixtures is suggested. After good correlation is obtained, particularly for lean mixtures, the calculation is used to determine the best combustion process by simulation on a computer. Since experiments show an important effect of the fuel-air heterogeneity, complementary simulating work is conducted in order to define the best fuel stratification laws. (Author abstract modified)

715 APTIC NUMBER 11739

Federal Power Commission, Washington, D. C., Bureau of Natural Gas
PRESENT AND FUTURE USE AND AVAILABILITY OF NATURAL GAS IN THE MINNEAPOLIS/ST. PAUL AREA. 24p., Feb. 1969.

The area which the Dept. of Health, Education, and Welfare proposes to designate as the Air Quality Control Region (AQCR) consists of the two cities Minneapolis/St. Paul and ten adjacent counties. The area is supplied with natural gas by one interstate transmission company, and the gas is distributed by two major distribution companies. Four smaller distribution companies and one small municipal system also serve the area with gas purchased from the transmission company. Virtually all of these distribution companies have plants to manufacture propane-air gas which is

mixed with natural gas during periods of peak demand. The transmission company also sells gas directly to several industrial plants in the area. These companies, along with the sales volumes, revenues, and rates are given in a table. Operating statistics are given for five plants. Four of the plants are major generating stations. The commercial and industrial gas consumption, namely, sales by companies and gas used in its generating plants for the five years 1963-1967 in the area, are tabulated. The data indicate that the gas consumption has been increasing by about four percent/yr and that the average gas prices during the period were fairly stable. A comparison of fuel prices submitted by the area gas distributors is given.

716 APTIC NUMBER 11969

TRASH INCINERATION PLANT FOR DARMSTADT. (Muellverbrennungsanlage fuer Darmstadt). Brennstoff-Waerme-Kraft, 16(8):408, Aug. 1964. Translated from German. 1p.

Two steel-tube boilers, each of 25 tons/hr steam capacity at 48 excess atm and 450 C are being furnished for a trash incineration plant for the city of Darmstadt. The trash incineration grates are designed for a trash throughput of 200 tons/day. The trash does not require preliminary pulverization or sorting. At about 1000 C incineration temperature, all possible putrefaction agents are destroyed; the ashes are therefore sterile and odorless. The dust is collected by filtering equipment to prevent pollution in the vicinity of the plant.

717 APTIC NUMBER 16855

Fish, B. R.
RADIATION IN PERSPECTIVE--THE ROLE OF NUCLEAR ENERGY IN THE CONTROL OF AIR POLLUTION. Nucl. Safety, 10(2):119-130, Mar-Apr. 1969. 35 refs.

Nuclear energy can play a critically important role in combating the growing assault on the purity of our atmosphere by supplanting fossil-fuel energy for most of the power plants to be built late in the century. Even then the same tight control that is currently exercised over the nuclear industry must come into being for other industries that are actual and/or potential polluters of the atmosphere. Several air-pollution disasters of the past emphasize the potential for future disasters. (Author's Abstract)

718 APTIC NUMBER 11803

Fuller, Louis J., Ralph E. George, and John E. Williamson
SOME OBSERVATIONS ON AIR POLLUTION IN NEW YORK CITY: A REPORT TO THE MAYOR. Los Angeles County Air Pollution Control District, Calif., 30p., Jan. 17, 1966.

Air pollution in New York City has attained serious proportions as a result of the incineration of rubbish and garbage, combustion of fuels, motor vehicle emissions, and the growth of industries, both within the city and in adjacent areas. Precise information on the quantities of pollutants emitted by each source are needed. However, incineration and fuel combustion are so serious that abatement measures cannot await further studies. Rapid and substantial improvements in rubbish and fuel combustion pollution should be achieved by applying known techniques. Rubbish disposal pollution can be relieved by substituting sanitary landfills for incineration; installing baghouse type control devices on municiple incinerators; replacing single-chamber and flue-fed incinerators with gas-fired multiple-chamber incinerators; and permitting the use of domestic garbage grinders. Fuel combustion pollution can be relieved by substituting natural gas for coal and oil; prohibiting the use of coal and grade No 6 residual fuel oil by Consolidated Edison; requiring the installation of two-stage combustion controls on the power company's fossil fuel-fired boilers; and prohibiting further installation of fossil-fired power plants in or near the city. Specific information must be obtained on the nature and quantity of pollutants from all sources. In addition, the behavior and motion of pollutants in the atmosphere must be determined. To accomplish these objectives, emission inventories and a comprehensive meteorological survey should be undertaken and a comprehensive air monitoring program instituted. (Author summary modified)

719 APTIC NUMBER 11701

Gaskill, James R. and Charles P. Veith
OPACITY OF SMOKES FROM CERTAIN WOODS AND PLASTICS UNDER SMOLDERING AND BURNING CONDITIONS. Preprint, American Chemical Society, Washington, D. C., 8p., Nov. 28, 1967. 3 refs. (Presented at the Symposium of the American Chemical Society on the Flammability Characteristics of Polymers, San Francisco, Calif., March 31 and April 1, 2, 1968.)
CPSTI: UCRL 70794

A modified National Bureau of Standards smoke chamber with a radiant source furnace was used to obtain smoke property data for various constructional materials. The data were applied to calculate a Smoke Obscuration Index for the test materials, defined as the product of the maximum smoke density and the rate of density accumulation divided by the time to reach a critical density level. Experimental parameters were heat flux of 2.5 W/sq cm; smoldering and flaming exposures; closed chamber with normal air content; and ventilation rates of 3, 6, 12, and 20 air changes/hr. Results showed that smoldering woods yield denser smokes than burning woods; the opacity increases at a greater rate in the former case. With some exceptions, obscuration occurs in about half the time as when woods are burning. Smoldering and burning woods also show differences in the effects of ventilation on maximum smoke densities; under smoldering conditions, some woods require about twice as much ventilation as the others to reduce the density to a given value. With two exceptions, smoldering plastics yielded quite dense smokes and flaming exposure yielded faster obscuration times. The flame-resistant plastics yielded generally denser smokes; the others, lighter smokes, all compared to the smoldering densities. Three plastics tended to auto-ignite. A formula for calculating the smoke index of a material is suggested to describe the smoke opacity characteristics of a material under fire parameters which might be expected to occur in most cases.

720 APTIC NUMBER 11962

Gerhardt, R. and H. Eraer
MODEL INVESTIGATION OF THE OPTIMAL LAYOUT OF REFUSE INCINERATION PLANTS FOR SMALL AND MEDIUM-SIZED TOWNS ON THE BASIS OF THE EXAMPLE OF THE PLANT AT NEUSTADT IN HOLSTEIN.
Aufbereitungs-Technik, no. 3:110-119, 1964. 3 refs. Translated from German. 29p.

A refuse incineration plant without heat utilization is under construction in a town of 15,000 inhabitants which has wide seasonal variations in the amount of refuse to be incinerated. In the summer, refuse production per day is 100 cu m or 470 kg per inhabitant annually. During the remainder of the year, refuse production decreases to approximately 190 kg per inhabitant annually. The incineration portion of the plant is designed so that, during an 8-hr operation per day, the plant can handle the total refuse produced in the summer months. The capacity per hour of the plant will be 3.75 tons of refuse. The furnace chosen has a nominal capacity per hr of 4.72 tons. The plant will have a reserve capacity for refuse from parties who operate their own refuse collection systems and from industrial establishments. The plant is divided into two parts: the heavy supporting structure containing a refuse bin with a capacity of 320 cu m refuse (corresponding to a maximum refuse production of three days) and furnace feeding equipment. Refuse dumped into the refuse bin is transported by a crane to the feeder tunnel of the furnace and then by a hydraulically activated feeder device to the incineration grate of the furnace. A tilting grate is used. Air for burning is sucked from the refuse bin by an undergrate blast. Ash and slag are mechanically removed from under the grate and discharged through an underwater scraper. The incineration process can be varied according to the characteristics of the refuse. For instance, if the refuse burned has a low heating value, an oil burner can be used. Investment and operating costs for the incineration plant, heat power plant, and hot water and heat supply plant are discussed in detail.

721 APTIC NUMBER 18056

Glaser, Peter E.
POWER FROM THE SUN. Mech. Eng., 91(3):20-24, March 1969. 16 refs.

The projection of energy requirements vs fossil fuel availability shows that within a few hundred years other energy sources will be needed. Solar energy, perhaps gathered and focused by satellites, is one of the sources of energy that may become increasingly important. Some of the features of a satellite system are discussed. Based on present state-of-the-art of solar photovoltaic conversion devices there is little likelihood that the efficiency and cost per unit weight and per unit collector will be attractive enough to be used for converting significant amounts of energy with a satellite system. An entirely different type of material for solar energy conversion, organic semiconductors, are discussed. Problems of power generation and transmission, and of earth receiving stations are discussed briefly.

722 APTIC NUMBER 12202

Gluskoter, Harold J. and Jack A. Simon
SULFUR IN ILLINOIS COALS. Illinois State Geol. Surv. Circ. 432, 28p., 1968. 29 refs.

The occurrence and distribution of sulfur in Illinois coals was described. Sulfur is present within coal as sulfide, as sulfate, and in organic combination. Sulfide sulfur occurs primarily as pyrite. Sulfate sulfur is usually of little significance, except in weathered coals where ferric and ferrous sulfates may be of importance. There is a wide range of both pyritic and organic sulfur in face-channel samples of coal, although the range is less for organic sulfur than pyritic sulfur. Generally, there is a positive correlation between pyritic and organic sulfur in these samples. The pyritic sulfur is usually greater in the fusain bands than in the clarain and vitrain bands. The organic to pyritic sulfur ratios are higher for both vitrain and clarain, with clarain being the richest in organic sulfur. Three areas of relatively low-sulfur coal are sufficiently well known to be outlined and mapped. These are an area of Herrin Coal in south-central Illinois, an area of Herrin Coal in southwestern Illinois, and an area of Harrisburg Coal in southeastern Illinois. The organic sulfur content is more uniform throughout a vertical section of a coal seam than is the pyritic sulfur content. Large vertical variations in pyritic sulfur were commonly observed. When the mineral bands in excess of three-eighths thick were disregarded, there was a tendency for pyrite, and therefore total sulfur content, to be greater in the top and/or bottom benches of the coal seam. (Author abstract modified)

723 APTIC NUMBER 12440

Gorban', G. M. and V. D. Yablochkin
ON THE QUESTION OF IMPROVING SOME POLYVINYL CHLORIDE POLYMERS AND A METHOD OF IMPROVING THEIR TOXICITY. Kossich. Biol. Med., 1(2): 47-51, March-April 1967. 11 refs. Translated from Russian by E. Harter, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 8p., April 15, 1968.
CFSTI,DDC: AD 680928

Polyvinyl chloride insulation tapes are used to equip airtight closed spaces of small dimensions and the cabins of spaceships with electronic apparatuses. A method was developed for improving the polyvinyl chloride tapes for the purpose of decreasing their gas emanation. The overall gas emission or organic substances from the improved specimens of polyvinyl chloride tapes as a result of the treatment with 50% urea solution was reduced by a factor of 1.5. The improved polyvinyl chloride tapes gave off volatile chemical substances in small concentrations, which with long duration of their action on the organism cause only a weak biological effect. As a result of the treatment with a solution of urea, there was an improvement in the electrical insulation properties of the polyvinyl chloride tapes serving the purpose for which the materials were intended without change in their strength characteristics. The following gases are emitted from polyvinyl chloride tapes: aldehyde, carbon dioxide, dibutyl phthalate, fatty acids, carbon monoxide, hydrocarbons, hydrogen chloride, and organic chlorine compounds; their concentrations are recorded.

724 APTIC NUMBER 12388

Haynes, C. D. and M. Southall
EXHAUST EMISSIONS OF VEHICLES TESTED TO THE DRAFT EUROPEAN PROCEDURE. Inst. of Mechanical Engineers, London, (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 14p. 5 refs. (Nov. 25-26, Paper 13.)

A representative sample of about 100 cars was tested to establish the baseline emissions of vehicles in service in Great Britain according to the current draft test procedure drawn up by the Economic Commission for Europe. The full test procedure consists of four cycles of a specified speed-time relationship driven from cold in which the exhaust gas is collected in bags for subsequent measurement of gas volume and carbon monoxide and hydrocarbon concentrations. For greater convenience, most tests were run from the hot condition and corrections applied to give the equivalent cold start data. The results indicated that the average emission of CO for cars in service in Great Britain is 172 g for the four cycles of the test procedure from a cold start, equivalent to a concentration of 3.4%; the range of emissions is from 0.60 to 7.36%. Average HC emission was 11.0 g from a cold start. Simple engine maintenance on about half the vehicles tested and resulted in a 20% reduction in average CO mass emissions and 10% reduction in average HC emissions. Idle emission measurements were carried out with the vehicles hot. These varied from 0.2 to over 11.6% CO, with an average level of 6.1%. The average HC emission was 1550 ppm. Engine tuning reduced the average idle CO and HC emissions by 29 and 40% respectively. The idle setting was found to have a marked effect on emissions over the cycle, probably because of the large percentage of time in the cycle which is at very light throttle opening or closed. (Author abstract modified)

725 APTIC NUMBER 17362

Hillman, Richard L.
AUTOMOBILE EMISSION REDUCTION CONSIDERATIONS IN METROPOLITAN AREAS. Air Pollution Control Assoc., Pittsburgh, Proc. Air Pollution Control Assoc. Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Philadelphia, Pa., March 21, 1969, p. 36-43. 9 refs.

Vehicular pollution in metropolitan areas can be reduced in three ways: reducing activities causing pollution; reducing vehicular emissions; and reducing the impact of pollutants. The first involves the reduction of total urban transportation by controlling the demand for and/or supply of urban transportation; reducing metropolitan motor vehicle traffic by regulations, fuel taxes, license fees, and shifting demand to mass transportation; reducing the amount of driving in efficient modes by introducing new vehicle configurations and concepts, and improving traffic flow; or reducing the proportion of travel done by highly polluted vehicles. Two approaches considered in emission control are to prevent the formation of pollutants or to prevent the emission of pollutants to the atmosphere. Because of the large number of vehicles affected, consumer costs associated with emission-reduction steps may be large. The impact of pollutants can be minimized by proper highway design and consideration of the variables that affect traffic flow, by diverting traffic flow from streets with crowded sidewalks, and by increasing the average spacing between vehicles.

726 APTIC NUMBER 11981

Hradecky, Frantisek
METHOD OF FLY-ASH HANDLING IN LARGE POWER PLANTS, TRANSPORTATION OF THE ASH TO THE DUMPS AND INTO OPENCAST MINES AND PITS. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 61-70.

In general, hydraulic transportation is employed in Czechoslovakia for the disposal of ash and slag from thermal power plants. The materials are hydraulically transported to an excavator station and from there, by dredge pumps, to a dump. The method is reliable, but the dumps are a source of environmental contamination. Other possibilities of ash storage are represented by waste banks and mine pits. Transportation to the pits by means of dust-free rubber belts would be suitable, but the technology is not sufficiently developed. For distances to 10 km, pneumatic transportation seems the most advantageous, although the present equipment does not meet required technical standards. Problems to be solved involve the draw-off of fly ash from individual spoil banks to auxiliary collectors, the transportation of the ash to dispatching silos, and the problem of transporting slag in pneumatic fly ash destined for mines. In the mines, a part of the fly ash would be used for filling and for decontamination purposes; the rest would be added to waste banks. Theoretical calculations indicate that total power plant ash production could be stored in pits and waste banks. This solution would bring about better land utilization, reduce the cost of storing waste materials, and improve the appearance of the country.

727 APTIC NUMBER 11790

Jimeson, Robert M. and James M. Grout
SOLVENT REFINED COAL: ITS MERITS AND MARKET POTENTIAL. Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers (AIME), New York, N. Y., 22p., 1969. 7 refs. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, Washington, D. C., Feb. 16-20, 1969.)

The potential market for solvent refined coal is estimated to be between 17-28 million tons, with the market sufficiently scattered to support processing plants in at least four coal regions in the United States. Assuming an increasing demand for low-sulfur fuels, the potential market is expected to increase 40% in the next ten years. Solvent refined coal is the product of a process which dissolves raw coal in a solvent, separates the ash from the coal by filtration, and reconstitutes the coal from the solvent. The reconstituted coal is free of water, low in sulfur, very low in ash, and sufficiently low in melting point that it can be handled as a fluid. In its solid state, the product is brittle and readily grindable into a fine powder. Markets are possible in combustion, railroad locomotion, and carbon electrodes. The combustion characteristics of solvent refined coal are consistent with expected air pollution restrictions on the emission of sulfur and particulate matter.

728 APTIC NUMBER 11961

Joachim, H.
THE REFUSE INCINERATION PLANT OF THE MUNICIPALITY OF GLUECKSTADT IN HOLSTEIN. Aufbereitung-Technik, no. 3:126-129, 1968. Translated from German. 10p.

The construction of a refuse incineration plant with a capacity sufficient for a town of 14,000 residents is reviewed. Because of the dimensions and peculiarities of small-town refuse, a multiple zone pushing grate was chosen as the main component of the plant. The grate has a capacity of 3.28 t/hr at a volumetric weight of 463 kg/cu m. Ash and sludge in the residue is discharged through a wet ash removal plant, while scrap metal is separated by a drum magnet and compacted to 1:5 to 1:13. The slag and ash, free from scrap metal, can be used as fill and in general road construction. The scrap metal is returned to the steel industry. Combustion temperatures are between 750 and 900 C. However, transitory increases up to 1200 C must be absorbed. These peak temperatures occur when refuse from local industries (paper, paint) is included. The bunker space in the plant has refuse storage capacity sufficient for one week's refuse from all sources. Plant operations are controlled from a central room, so it is possible to operate the plant with two persons. For utilization of waste heat, the refuse incineration plant is provided with the sludge-drying plant.

729 APTIC NUMBER 16869

Kaiser, Elmer R.
SUCCESSFUL INCINERATORS ARE NOT CHEAP. Power, 113(9):78-79, Sept. 1969.

Whether incinerators only dispose of refuse or generate steam as well, careful design is needed to make them acceptable to their users and to the community. The sizing, location, and control of air jets to promote complete combustion, corrosion, and stack height are among the problems that must be considered in incinerator design. A large multipurpose incinerator plant constructed in Stamford, Conn. is described briefly.

730 APTIC NUMBER 16866

Keeler, W. W.
THE ROLE OF NGL IN INDUSTRY. Power, 113(9):82-84, Sept. 1969.

The natural gas liquids (NGL) industry may well find one of its greatest challenges in helping reduce air pollution in our country. An over-simplified definition of NGL would be "liquid hydrocarbon products which are extracted from natural gas as it leaves the ground." They consist of ethane, propane, butanes, pentane and heavier products. Propane and the butanes constitute what is referred to as liquefied petroleum gas (LPG); pentane and heavier hydrocarbons make up natural gasoline, which go to refineries either to be blended into motor fuel or to be upgraded into more valuable products. The major markets for these liquids are as suppliers of energy, as chemical feedstocks, and as blending components for motor fuel.

731 APTIC NUMBER 17327

Kitagawa, Tetsuzo
CONTROL OF AIR POLLUTION CAUSED BY EXHAUST GAS OF AUTOMOBILES. (Jidosha haikigasu ni yoru taiki osen no boshi taisaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(11):741-749, Dec. 15, 1966. 8 refs.

The most practical means to control automotive exhaust gas varies from country to country according to geographical and meteorological conditions. Attempts to compare the status of pollution from auto exhaust gas in Los Angeles, where air pollution is widely known as photochemical smog, with that of Japan should be rejected. Photochemical smog is endemic to Los Angeles, where a heavy layer of atmospheric temperature inversion is present 80% a year. The Los Angeles atmosphere is a chemically-oxidized atmosphere containing substantial amounts of nitrogen, oxides, ozone, ozonated olefins, and organic peroxide compounds in addition to compounds from partially-burned fuels and aerosols formed by polymerization. In Japan, air pollution caused partially by auto exhaust gas is conditioned by relatively shorter periods of temperature inversion, the constituents of which, for the most part, result from heat radiation from ground surfaces, (the so-called night temperature inversions). This is quite contrary to the vast expanse of polluted atmosphere in Los Angeles. The production of photochemical smog is closely related to nitrogen oxides and hydrocarbons. Air pollution by motor vehicles in Japan is strictly confined to carbon oxides alone which are measured in air space surrounding a highway only, in the horizontal range of less than 100 m and at a vertical height of about 10 m. It is concluded that carburetor controls are the most practical way to reduce emissions of carbon oxides in Japan.

732 APTIC NUMBER 12297

Klimek, W.
AIR POLLUTION AROUND A VISCOSE FACTORY AT ZYDOWCE (SZCZECIN). (Zagryaznenie atmosfernogo vozdukha vokrug predpriyatiya iskusstvennogo volokna v Zhidovtsakh okolo Shchetsina). Hyg. Sanit., 33(7-9):257-259, July-Sept. 1968.

Air quality measurements were made in 1955-56 and 1964 in the vicinity of a viscose plant in Szczecin, Poland. The plant was found to be a source of heavy air pollution from carbon disulfide and hydrogen sulfide. Air pollution from CS2 showed a marked increase during the time between the two surveys, to a level over 150 times greater than the maximum permissible concentration. The radius of the area affected by the emissions increased to over 2000 m from the plant. It is concluded that control measures must be implemented in order to achieve safer ambient conditions for the nearby residential population. (Author conclusions modified)

733 APTIC NUMBER 17344

Knop, Wilhelm
INDUSTRIAL DUSTS AND WASTE GASES. (Industriestaeube und-abgase). Text in German. Wasser Luft Betrieb, 14(1):20-23, Jan. 1970.

The major sources of dangerous and annoying industrial dusts or gaseous pollutants are enumerated. In mines, coking plants, and

gas works, dusts develop at the sorting, crushing, and mixing processes. The extent of dust development depends on the water content, the grain size, and the strength of the material. Waste gas and vapor develops behind driers, transportation facilities, and in the quenching of coke. The chemical industry produces the dangerous halogen gases, of which chlorine and bromine are the most harmful. The maximum allowable long-term emission concentration for chlorine is 0.1 cu cm/cu m air; the short-term value is three times daily 0.5 cu cm/cu m air. Hydrogen chloride develops at the manufacture of dyes. The maximum allowable emission concentration for fluorine is 0.5 cu cm/cu m air. Flourine compounds (in gaseous form or dust) develop in aluminum production, fertilizer manufacture, and at the polishing stations for quartz and glass. With sulfuric acid production in a Claus furnace or in the manufacture of dyes SO2 and SO3 develop. The maximum allowable concentration for these pollutants is 0.2 cu cm/cu m air. Hydrogen sulfide has been limited to 0.1 cu cm/cu m air. It develops in refineries in dye and viscose manufacture. A particularly noxious gas is carbon monoxide which develops in phosphorus and carbide plants. Quarries, cement factories, the ceramic industry, mixers for asphalting highways, iron ore sintering plants, blast furnaces, and foundries all are large contributors of dust and gaseous emissions.

734 APTIC NUMBER 17404

Kobayashi, Ryo
SUPER HIGH STACK. (Choko entotsu). Text in Japanese. Doboku Gakkaishi (J. Japan Soc. Civil Engrs.), 55(2):64-67, Feb. 15, 1970.

A tall stack should function to eliminate down-draft phenomenon and other causes of air pollution and to decrease the ground-surface density of smog. The Air Pollution Control Act of Japan established limits for chimney exhaust and the sulfur content of fuel, and at the same time prescribed the minimum effective height of a chimney. In England and West Germany, chimney height is calculated with a nomograph. The effective height of a chimney can generally be determined by the formulas of Sutton and Bosanquet, which are commonly used for calculating the ground-surface density of smog, and by taking into account a wind test and geographical and weather conditions. Of the many kinds of tall chimneys, a tube-assembly-system, because of its material and its way of load distribution, is largely adopted for increasing the rising rate of smoke. A chimney should be resistant to winds and earthquakes. The steel chimney commonly used in Japan is advantageous with respect to earthquakes, but is apt to vibrate under the influence of 'von karman's vortex street'. Ground conditions make the steel chimney with a steel-supporting-structure popular in Japan. In the case of reinforced concrete chimneys, constructed largely in Europe and the U.S.A., extremes of temperature and the weight-supporting system should be considered. Together with increased chimney height, new construction methods are being developed to insure to the security of chimneys. The paper includes a schematic representation of a steel chimney with a steel-supporting system.

735 APTIC NUMBER 12199

Lachapelle, D. G., J. L. Tarbox, J. C. Maloney, H. G. Bradbury, M. H. Godbold, and W. P. Miller
A FIELD-EXPEDIENT INCINERATOR (PROJECT TEE PEE). Edgewood Arsenal, Md., Contract DA-18-035-AMC-1057(A), Task 1W022601A089-04, 129p., Jan. 1968. 23 refs.
DDC: AD 664118

An incinerator for expedient concentration of combustible radioactive waste was designed, built, and evaluated. It features portability and ease of assembly. This incinerator (referred to as Tee Pee) employs five oil-fired burners that ignite the waste material and reduce the particulate emission. Four incinerations or 'burns' were conducted with rough-cut lumber contaminated with the radioisotope lanthanum 140. The lumber for the burns was prepared as follows: Burn 1-Lanthanum-tagged particles, ranging from 75 to 150 micron, were affixed to the lumber with a dilute lacquer spray; Burn 2-Lanthanum 140, in solution, was brushed onto the lumber; Burn 3-Lanthanum-tagged particles, ranging from 20 to 75 micron, were 'dusted' over the lumber; and Burn 4-Lanthanum 140, in solution, was brushed onto the lumber. The results of these burns are as follows: (1) average burning rates in excess of 600 lb/hr were achieved; (2) average weight reduction (the ratio of input weight to resultant ash weight) was 115 to 1; and (3) with a variety of simulants and activities, and under the conditions of this experiment, the resultant downwind concentration of airborne contaminant was always below the Maximum Permissible Concentration (MPC) for the isotope used. The conclusion based on these results is that the Tee Pee is a practical device for efficient field-expedient incineration and concentration of combustible radioactive waste. Numerous data and illustrations are given. Supporting data are contained in six appendices. (Author abstract modified)

736 APTIC NUMBER 17335

Lavoie, George A., John B. Heywood, and James C. Keck
EXPERIMENTAL AND THEORETICAL STUDY OF NITRIC OXIDE FORMATION IN INTERNAL COMBUSTION ENGINES. Combust. Sci. Technol., 1(4)313-326, Feb. 1970. 15 refs.

The nonequilibrium formation of nitric oxide within the internal combustion engine cylinder was examined. A thermodynamic model which predicts the properties of the burnt and unburnt gases during the combustion process was developed. A set of reactions which govern the formation of nitric oxide was proposed, and rate equations for nitric oxide concentrations as a function of time in the post-flame gases were derived. The results of time-resolved measurements carried out on a CFR engine were described, where emitted light intensities at wavelengths selected to record radiation from the CO + O and NO + O continua were used to determine the nitric oxide concentration. Results showed that both the formation and decomposition of nitric oxide in the post-flame gases are rate limited at the conditions under which internal combustion engines normally operate. In the lean case, the nitric oxide formed in the flame front is negligible. The state of the burned gas is not uniform. A substantial temperature gradient and nitric oxide concentration gradient exists behind the flame zone. The comparisons between theoretical and experimental results for fuel-lean mixtures confirmed that the important features of the model were correct.

737 APTIC NUMBER 12505

Marshall, W. F. and R. W. Hurn
FACTORS INFLUENCING DIESEL EMISSIONS. Preprint, Society of Automotive Engineers, Inc., New York, 1[illegible]., 1968. 6 refs. (Presented at the West Coast Meeting, Soc. Auto. Engrs., San Francisco, Calif., Aug. 12-15, 1968, Paper 680528.)

Smoke, odor, and other emissions of concern in environmental pollution from four diesel engines were studied experimentally. Engine design, operational mode, and fuel characteristics were considered as variable factors influencing the emissions. The engine included a turbocharged 4-cycle unit, normally aspirated 4-cycle units, and an air-scavenged 2-cycle engine. All were direct injection, truck-type power units. Fuel characteristics differed widely among eight fuels used in the study, with principal differences occurring in sulfur and aromatic content. Results of the experimental study showed that emissions levels in all categories are markedly influenced by engine operation. Within the group of engines tested, generally high emissions of unburned hydrocarbons are associated with the 2-cycle design, high smoke levels with the 4-cycle normally aspirated engines, and high emissions of NO(x) and oxygenates with the turbocharged 4-cycle engine. Exhaust odor intensity levels were roughly equivalent for all engine types. Emissions in all categories were surprisingly insensitive to variation in fuel characteristics, with the exception that smoke levels were significantly reduced with addition of a smoke suppressant additive to the fuel. Neither of two odor inhibitors was found effective. (Author abstract modified)

738 APTIC NUMBER 11763

Meyer, W. E.
EXHAUST EMISSIONS OF A STRATIFIED CHARGE ENGINE. (FINAL REPORT). Pennsylvania State Univ., University Part, Dept. of Mechanical Engineering, NAPCA Contract PH-86-63-112, Rept. 533, 20p., 1968 (?). 8 refs.

An attempt was made to determine the exhaust emission characteristics of a stratified charge engine employing the Witzky swirl-stratification process. The basic principle of the process is that of inserting a fuel cloud into the engine combustion chamber which basically contains air only. To accomplish this, the air is introduced into the engine cyclinder in such a manner that the entire air charge rotates. The fuel is introduced into the swirling air mass by injection during the compression stroke. Thermodynamically, the engine is comparable to the diesel engine and comparable efficiencies and emission characteristics were anticipated. Test results indicated a zero output at a finite fuel quantity and significant variations in the air flow in the engine cylinder from cycle to cycle. It had been assumed that a fuel cloud would form in the center of the combustion chamber because of a secondary flow phenomena. The flow proved too weak and developed too slowly to affect mixture formation and combustion. The cycle-to-cylce variations of air flow were found to be the consequence of constantly changing interaction between spray and air flow. Exhaust gas analysis showed excessively high hydrocarbon concentrations. Carbon monoxide and nitrogen oxide emissions were low. The process will be acceptable in terms of performance and hydrocarbon emissions only if a means is found to stabilize the air motion within the cylinder.

739 APTIC NUMBER 12377

Millington, E. W.
THE NATURE AND CAUSE OF DIESEL EMISSIONS. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 5p. 16 refs. (Nov. 25-26, Paper 2.)

The combustion mechanism in a diesel engine differs somewhat from that in a gasoline engine, tending nearer to diffusion flame conditions than premixed flame, as a result of which a higher level of smoke appears in the exhaust. In order to keep the smoke emission within reasonable limits, the diesel engine is always operated at overall fuel/air ratios weak of stoichiometry; this probably contributes to the lower levels of other objectionable emissions such as carbon monoxide, unburned hydrocarbons, and oxides of nitrogen. Continued detail development of the combustion chamber geometry, air flow pattern, and fuel spray distribution should lead to reduced smoke emission, and possibly to reduced HC and CO at the same time. Oxides of nitrogen may be increased by these changes, but on the other hand, chamber configurations are known which materially reduce the NOX levels; chamber developments along these lines could be beneficial. Exhaust recirculation or retarded timing can help, but at a loss in thermal efficiency. Odor is associated with such poor combustion conditions as excessively weak zones in the mixture pattern or unduly late combustion. Appropriate engine development should improve the situation. Carcinogens are only produced in appreciable quantities under very poor combustion conditions; even then, there is little evidence that they are a hazard. Modification of fuel properties may assist in some measure to reduce emissions, but this route appears to have only limited possibilities. (Author conclusions modified)

740 APTIC NUMBER 12507

Murray, F. E.
AIR POLLUTION FROM BIVALENT SULFUR COMPOUNDS IN THE PULP INDUSTRY. Preprint, Engineering Inst. of Canada, 16p., 1968. 10 refs. (Presented at the Banff Pollution Conference, Banff, Alberta, Can., March 1968.)

In the kraft process of producing chemical cellulose from wood chips, the chips are cooked in a solution containing sodium hydroxide and sodium sulfide in about a four-to-one proportion. This method produces much greater air pollution, in the form of highly malodorous compounds, than the alternative sulfite processes. The three primary sources of odor production in a kraft pulp mill are the digestion process, the direct-contact evaporator, and the recovery furnace. In the digestion process, control must be effected on the noncondensible gases from the digester and blow tank, from the multiple-effect evaporators, and on the foul condensates that are formed in contact with these gases. The emission of hydrogen sulfide from black liquor during direct contact evaporation can be very substantially reduced by oxidation of the sulfide. The problem of the recovery furnance is one of good operation and combustion control within the furnace design capacity. Present laboratory studies are expected to lead to continuing improvement in the control of odorous emission from kraft pulping operations.

741 APTIC NUMBER 11974

Nikami, K., K. Matsuda, T. Koyano, and T. Yasui
THE WASTE GASES LEAVING THE BASIC OXYGEN LD FURNACE. Tetsu To Hagane, 52(9):1491-1493, 1966. Translated from Japanese. Henry Brutcher, Technical Translations, Altadena, Calif., 8p., 1967.

Basic oxygen furnace gases were examined with a view of utilizing their properties to automate the steelmaking process in the basic LD oxygen furnace. The sampling apparatus consisted of a water-cooled probe fitted with channels for water cooling and gas, and a suction disk with a steam injector. The following properties were determined for the gases emerging from the sampling system: gas temperature at the suction disk outlet, 30-40 C; humidity at the suction disk outlet, 100%; dust content at the suction outlet, 0.2 g/N cu m; and gas temperature at the cooler outlet, 5 C. Hardly any obstruction of the probe tip took place during the blow, indicating that continuous analysis of carbon monoxide and carbon dioxide is possible. When the relationship between the CO and CO2 contents of the gas was investigated, an almost identical pattern was obtained, even when the oxygen lance height and the blowing pressure were changed. After 70% of the blow was completed, the percentages of CO and CO2 became constant. When the steel carbon content decreased below 0.10%, the concentration of CO decreased and that of CO2 increased. Though no direct connection was established between the proportion of CO and CO2 in the furnace gases and the reactions taking place in the furnace, it is believed that the gases provide useful information about blowing processes.

742 APTIC NUMBER 11972

Palm, R.
FUNCTIONS AND COMPUTATION DATA OF REFUSE INCINERATORS. Energie (Munich), 17(12):539-542, Dec. 1965. 2 refs. Translated from German. 13p.

Design and evaluation factors for the firing chamber of refuse incinerators are reviewed. This chamber mixes both the combustible gases developed over the grate and the flying coke carried by them with the excess of air flowing through the grate, and burns the mixture. The chamber is limited by the grate, a short feeder vault, and a longer, vertical recycling vault; the flame must reflect heat back to the grate by the vaults. The coarse dust from refuse incinerators should at least be trapped, and particular attention must be paid to cleaning fly ash from the heating surfaces of the incinerator equipment. Grate widths are given for small installations; small grates are often troubled by slag, and therefore grate size should not be less than 1.20 m., even if loads are small. On the other hand, oversize grate widths result in a slower grate movement and less of a stoking effect. In a discussion of thermal stress of the firing chamber, the method for calculating thermal efficiencies in the presence of different types of refuse is developed, and several examples are worked out.

743 APTIC NUMBER 17354

Patterson Wilhelm, Ekkehard Weber, and Gerhard Engels
CONTENT OF FLUE DUST IN CUPOLA TOP GASES FROM CUPOLAS OF DIFFERENT CONSTRUCTION TYPES AND OPERATING CONDITION. (Staubgehalt von Kupolofengichtgasen bei Kupoloefen unterschiedlicher Bauart und Betriebsweise). Text in German. Giesserei (Duesseldorf), 57(4): 73-83, Feb. 12, 1970. 25 refs.

A comparison of the dust content of the waste gases of various types of cupola furnaces was performed in order to determine the efficiency requirements of dust collectors for cupola furnaces to meet legal limits. The information provided by the literature in this field could not be used for the comparison, since the measuring methods used by the various authors differed too much. Thus dust measurements were taken at 35 various types of hot blast and cold blast cupolas. The measured dust concentrations were referred to the quantity of undiluted waste gas leaving the cupolas and to the melting capacity. The average dust concentration in the waste gases of hot blast and cold blast cupolas and the dust emissions were approximately the same. Wider scattering was found at hot blast cupolas. The grain size distribution at all furnaces showed three maxima in the ranges 2 to 5 micron, 20 to 50 micron, and 100 to 500 micron. It is assumed that these maxima are caused by burned metal residues, smoldered organic substance particles, coke ash, and abrasions and sand adhering to the charging material. The coarse dust fraction above 63 micron increased with increasing specific blast volume and with the degree of impurity of the charging material. The dust fraction below 63 micron constituted less than 50% of the total dust quantity and was higher at hot blast cupolas than at cold blast cupolas. It increased when the steel scrap portion or the coke rate increased. The dust emission per ton of iron depends primarily on the coke rate and on the properties of the coke.

744 APTIC NUMBER 11606

Robinson, L. B. and J. D. Pinkerton
COMBUSTION PROCESS ANALYSIS. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 81-90, Sept. 1968. 16 refs.

The formation of exhaust gas pollutants in the Otto cycle engine, and methods for predicting actual engine performance including friction, heat transfer, and irreversible chemical reactions, are under investigation. A comparison of nitric oxide emission levels calculated from kinetic data, with experimentally measured values reported by other investigators, indicates that current formation mechanisms provide adequate explanation for the NO present in engine exhausts. Experiments are suggested to examine the validity of the theory that hydrocarbon exhaust emissions are formed in a quench zone next to the wall of the combustion chamber in Otto cycle engines. Despite the difficulty of calculating the hydrocarbon exhaust emission from an engine, current understanding of the hydrocarbon mechanism suggests that turbo-compounding an Otto cycle may prove a very effective way to maintain high thermal efficiencies while utilizing the low emission characteristic of low compression ratios. A literature review concerning engine friction is in progress.

745 APTIC NUMBER 17385

Robinson, Elmer and Robert C. Robbins
GASEOUS SULFUR POLLUTANTS FROM URBAN AND NATURAL SOURCES. J. Air

Pollution Control Assoc., 20(4):233-235, April 1970. 15 refs.

The atmospheric pollutants sulfur dioxide and hydrogen sulfide and the H2S and sulfates from the natural environment are considered with respect to their sources, their atmospheric concentrations, their reactions, and available scavenging mechanisms. Natural emissions of sulfur, in the form of H2S, are about 30% greater than are the estimated industrial emissions of SO2 and H2S, i.e., 122,111,100 tons as sulfur from H2S, compared to 76,000,000 tons as sulfur from SO2. Within the atmosphere there is a net transfer of sulfur from land to ocean areas. With regard to sulfur pollutants, SO2 is the only significant pollutant, and the transformation of SO2 to SO4 occurs in a matter of days. Most of the emitted SO2 becomes SO4 in the atmosphere as a result of several possible photochemical or physical reactions. The rapid reaction rate plus ready absorption of SO2 by vegetation contributes to a rapid decrease in concentrations outside emission source areas. More than two-thirds of the natural and pollutant sulfur emissions occur in the northern hemisphere. When only pollutant emissions are considered, 93% occur in the northern hemisphere. (Author conclusions modified)

746 APTIC NUMBER 12299

Samoilovich, L. M. and Yu. M. Red'kin
AIR POLLUTION WITH 3,4-BENZPYRENE BY PETROCHEMICAL ENTERPRISES. (Zagryaznenie atmosfernogo vozdukha 3,4-benzpirenom predpriyatiyami neftekhimicheskoi promyshlennosti). Hyg. Sanit., 33(7-9):320-325, July-Sept. 1968. 7 refs.

Air quality measurements were made in the vicinity of an oil-chemical industrial complex to determine 3,4-benzpyrene concentrations, as measured by fluorescence spectroscopy. Over a three-year period, 210 analyses were performed. A 3,4-benzpyrene pollution of 0.15 - 2.2 mkg/100 cu m was found within a 2-km radius of the plants. The heaviest pollution came from the coking and pyrolysis shops. The experimental data are applicable to the determination of required width of the sanitary-protective zone around petroleum processing plants.

747 APTIC NUMBER 11860

Schaffer, S. G. and H. W. Noble
TECHNIQUES FOR THE UTILIZATION OF FLY ASH. Am. Chem. Soc. Div. Fuel Chem. Preprints, 10(1):73-80, 1966. (Presented at the American Chemical Society Division of Fuel Chemistry Symposium on Fossil Fuels and Environmental Pollution, joint with the Division of Water, Air, and Waste Chemistry, Pittsburgh, Pa., March 22-23, 1966.

Fly ash has been utilized with limited success as filling material for asphalt roadways and as a substitute for cement in the production of concrete. Roads with asphalt filling performed well, but this method of utilization would not nearly approach the total amount of fly ash produced each year by the electric industry. Bulk concrete and concrete blocks with fly ash additives in quantities up to 25-30% show good compressive strength, and this method of utilization would provide a market for all fly ash produced. However, several factors limited the marketing of fly ash on so large a scale. Among them are variations in the properties of fly ash from location to location and time to time; the possibility of staining due to the presence of iron; transportation costs; and problems of storage. To date, the most promising method for utilizing fly ash appears to be as a lightweight aggregate. When sintered and crushed, the product can be used as a substitute for fine or coarse aggregate in concrete, concrete block, roadways, and wherever aggregates are required. The advantage of sintered fly ash aggregate is its weight. When sized to concrete block grade, sintered fly ash weighs 40-50 lbs/cu ft. Such a reduction in block weight can mean a decrease in building structure, handling, and shipping costs. Concrete and concrete block using fly ash aggregate greatly exceed minimum strength requirements.

748 APTIC NUMBER 16887

Slansky, Cyril M., Henry K. Peterson, and Vernon G. Johnson
NUCLEAR POWER GROWTH SPURS INTEREST IN FUEL PLANT WASTES. Environ. Sci. Technol., 3(5):446-451, May 1969.

The potential radiation hazard connected with the release of Kr-85 from the expanding fuel cycle industry has been studied in detail. One of the main problems in studying this nuclear waste management is estimating the rate of atmospheric dilution of the relatively concentrated off-gas from fuel reprocessing plants. The major variables are: Rate at which the waste is generated (the size of the reprocessing plant), stack height, local meteorology, nature of the terrain, time interval on which the dose is calculated, downwind distance of the perimeter fence around the plant. These factors and the alternative processes for Kr-85 off-gas treatment are discussed.

749 APTIC NUMBER 11994

Spurny, Kvetoslav
THE DEGREE OF DISPERSITY OF EXHALATED POLLUTANTS. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 214-225. 5 refs.

The biological effect of pollutants depends on two main factors: the toxicity of their components, and the degree of their dispersity. The latter represents the reciprocal value of the mean size of the particles of the dispersed part of harmful substances. Grossly disperse substances (particle size 0.01 to 0.0001 cm), produced by the combustion of solid fuels, will soon form only a small part of emissions in technically developed countries. Due to the increasing use of natural gas, liquid fuel, the growth of atomic energy, and improvements in flue-gas cleaning, contaminants in these countries will shift to the range of colloid dispersion (particle size 0.0001 to 10 to the minus 7th power cm) and that of trace toxic gases. Consequently, the pressing pollution problem will be emissions of high dispersity, e.g., smog and aliphatic and cyclic hydrocarbons. In Czechoslovakia, gross contaminants (fly ash and sulfur from thermal power plants) will continue to be a problem up to the 1980's. A nation-wide program for their reduction is required.

750 APTIC NUMBER 12430

Taylor, F. R., Z. G. Tomaras, and W. E. Scott
EMISSIONS FROM FUEL OIL COMBUSTION (FINAL REPORT). Scott Research Labs., Inc., Perkasie, Pa., SRL Proj. 1009c, 40p., March 1, 1963. 8 refs.

A survey was made of the stack emissions from 25 residential heating units of various designs using No. 2 fuel oil and 4 industrial units burning No. 6 fuel oil. Emissions of the pollutants by the industrial units were comparable to the emissions from residential units except for sulfur dioxide which was proportional to the sulfur in the fuel. Ethylene and acetylene were specifically indentified from the hydrocarbons emitted and were measured by infrared absorption. By concentrating the emissions after warm-up in cold traps and separating the hydrocarbons and oxygenated hydrocarbons by gas chromatography, specific information was obtained. Hydrocarbons in the C4 to C6 range, saturated or unsaturated, were found in concentrations of less than 4 parts per billion for 17 of the 25 residential units. average total concentration on hydrocarbons in the C5 to C12 range was found to be about 25 parts per billion and the average total concentration of oxygenated hydrocarbons was about 10 parts per billion. Fluorescence spectrometry showed that under normal operation, fuel oil No. 5 produced particulates containing negligible quantities of polycyclic aromatic hydrocarbons. When the burner was operated under non-ideal combustion conditions, particulates were produced containing at least 11 polycyclics which included benzo(a)pyrene. It was found that 15 of the residential units emitted less than 8% CO2, which was attributed to leaky fire boxes. Periodic maintenance to reduce the infiltration of air into the combustion chamber would not only increase the over-all efficiency of the unit, but also minimize the production of polycyclic aromatic hydrocarbons resulting from incomplete combustion. (Author summary modified)

751 APTIC NUMBER 11702

Ter Haar, G. L., R. B. Holtzman, and H. F. Lucas, Jr.
LEAD AND LEAD-210 IN RAINWATER. Argonne National Lab, Ill., Radiological Physics Div., Annu. Rept. ANL-7360, p. 144-146, July 1966 through June 1967. 16 refs.
CFSTI: TID-4500

Samples of rainwater collected at semirural and rural sites were analyzed for lead and Pb210. The concentrations of the stable lead and Pb210 and the amount and type of rainfall in various samples are tabulated. The arithmetic mean lead concentration of 18.9 micrograms/l at the semirural site was essentially identical to the 17.4 micrograms/l at the rural site. Similarly, the mean concentrations of Pb210 were 1.26 and 1.78 pCi/l at the respective sites. There appeared to be a correlation between the type of rain and the concentrations; a shower had lower concentrations than a slow, even rainfall. Thundershowers ususally had lower concentrations. No correlation was found between lead concentration and length of time between rains. The rates of deposition of lead and Pb210 in the soil were small. The average specific activities of the lead (pCi Pa210/gPb) were 67,000 pCi/g at the semirural site and 104,000 pCi/g at the rural site; the correlation coefficients for concentrations of lead and Pb210 at the two sites were 0.98 (p less than 0.0001) and 0.63 (p less than 0.1), respectively. The data show a good mixing of lead and Pb210 in the atmosphere before they are returned to earth in rainfall. Thus Pb210 is a valid tracer for stable lead in the atmosphere.

752 APTIC NUMBER 11703

Toone, B.
A REVIEW OF AERO ENGINE SMOKE EMISSION. Preprint, College of Aeronautics, Cranfield (England), 38p., 1967. (Presented at the International Propulsion Symposium, Combustion in Advanced Gas Turbine Systems, Cranfield, England, 1967.)

Methods of measuring smoke concentrations and the mechanisms which give rise to smoke production from aero engines are discussed. Light absorption, filtration, and visual comparison are the three basic measurement methods. Smoke sampling techniques, flame structure, and the zone of carbon formation are reviewed. Carbon concentrations increase with pressure because exhaust smoke has never been noted on engines with compressor outlet pressures less than 130 psia. Increasing the overall fuel/air ratio increases the amount of fuel in the primary zone; which may be expected to increase the richness in the reversal zone and hence increase carbon formation. Smoke also increases with reduction in burner cone angle. Tests indicate that a one-factor pressure loss should reduce smoke by about 30%. Aromatic fuels of closed ring structures smoke much more readily than straight chain hydrocarbons, but the effect of fuel quality is small compared to changes achieved by improving air and fuel mixing. Blue smoke is due to fuel chilling or excess air, while black smoke is from lack of air. Fuel additives show some potential for reducing exhaust smoke, but also have significant disadvantages. The development of engines with high operating pressures and lower pressure loss factors has tended to produce higher engine smoke levels, but, to date, it has been possible to reduce smoke by combustion chamber modifications to satisfactory levels.

753 APTIC NUMBER 17405

Tsunoda, Fumio
A NEW ASPECT OF AIR POLLUTION - FLUORIDES. (Taikiosen mondai no aratano ichi kyokumen - fukkabutsu ni yoru hai o reini). Text in Japanese. Igaku No Ayumi (Progr. Med.), 70(2):621-622, Sept. 27, 1969. 2 refs.

As a result of industrial growth, atmospheric contamination by mercury, lead, fluorine and other compounds is becoming noteworthy. An aluminum refinery in Aizu Basin was blamed for the death of all silkworms in the area. Trees shed their fruit prematurely. The harmful compound was: 3NaF-AlF3. The fluorine contained in it contaminated the atmosphere and badly damaged plants. Some plant species were sensitive to only a few ppm. Many accumulate fluorine, paddy and gladiolus. This is the reason why cows and silkworms were poisoned. Also, there is a possibility that human beings accumulate too much fluorine in their bodies. Even a few ppm in the air may exert a direct influence. In the Aizu district, inquiries were made into the effects of long-term exposure to

fluorine. Persons who had accumulated fluorine for many years were examined with regards to the quantity of fluorine in urine, lung function, existence of spotted teeth, and bone softening especially the pelvis and the limbs). Results of the study have not yet been issued. The major sources of fluorine are aluminum refineries whose number is expected to increase. In the near future, fluorine will be also used for atomic power industries. It is concluded that the air pollution research has arrived at the stage where not only the atmosphere but also water, soil, and food are objects of study because of an indirect contamination through air.

754 APTIC NUMBER 11882

Wilcox, Howard A.
PRESENT STATUS OF ELECTRIC VEHICLE RESEARCH AND DEVELOPMENT IN GENERAL. Preprint, Santa Clara Valley Engineers Council, San Jose, Calif., 17p., 1967. (Presented at the Symposium of the National Electric Automobile, San Jose, Calif., Feb. 24-25, 1967.)

The design and operating characteristics of two experimental electric-powered vehicles developed by General Motors are reviewed, together with the current status of the company's electrochemical energy conversion program. The vehicles are the Electrovair II and the Electrovan. Their motors are of the squirrel-cage induction type, where the 'slip frequency' is controlled by a 'modulating inverter' assembly that permits rotational speeds of about 13,000 rpm. A 530-volt silver-zinc battery system is used for the Electrovair II. Because the battery's energy storage and power capabilities are limited, the vehicle weighs 800 pounds more than its counterpart, the standard 1966 Corvair. Its operating range is only 40 to 80 miles as compared to the 250-300 mile range of the Corvair. However, acceleration performance of the two cars is comparable. The Electrovan's fuel battery uses pure hydrogen as the fuel and pure oxygen as the oxidizer. It is unlikely that this battery system would be satisfactory as an energy source for passenger vehicle transportation. The total weight of the Electrovan is 7100 pounds as against the 3250 pounds of a standard production van; top speed is 70 miles an hour, and range is 100-150 miles. Of the electrochemical power systems studied, a lithium-chlorine system appears most promising in terms of energy yield and power capacity. Work to date indicates the technical feasibility of someday achieving a rechargeable lithium-chlorine electrochemical power system with the following characteristics: open circuit voltage, 3.5 volts; average operating voltage, 3.2 volts; power capacity, 0.2 hp per pound of power system; and energy storage capacity, 0.13 hp-hr per pound of power system.

755 APTIC NUMBER 17411

Yamamoto, Takeo
AIR POLLUTION FROM THE TRAFFIC POINT OF VIEW. (Taikiosen no mondai. Kotsuumondai tono kanren nioite). Text in Japanese. Doboku Gakkaishi (J. Japan Soc. Civil Engrs.), 55(2):60-63, Feb. 15, 1970. 8 refs.

Air pollution caused by motor traffic irritates eyes and damages crops, plants, rubber tires, etc. In Japan, engine exhausts were considered to be a local problem, not an important pollution source. However, increasing traffic has focused attention on the problem. To control emissions, new permissible standards for exhaust were included in 1968 air pollution legislation. Among the exhaust components, CO is the most harmful, but its density in a street is influenced by atmospheric phenomena and the structure of a city, as well as by traffic. For example, if the height of buildings adjacent to a street is larger than the width of the road, the waste gases tend to be stagnant in spaces between buildings. The same result is caused by wind blowing against the building. An engine must be developed that does not produce waste gas. Skew crossroads and high-speed roads should be constructed in addition to widening roads. Moreover, the distance between a thoroughfare and residences should be increased. Results of measurements in Kyoto city are presented to support this view.

756 APTIC NUMBER 17397

Yamazaki, Kiroku
ALTERNATIVE NONPOLLUTING PRIME MOVERS FOR AUTOMOBILE. (Gainen jidosha enzin). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 49(514):77-88, Feb. 20, 1970. 10 refs.

Since the conventional spark ignition engine is now the principle source of air pollution, the development of alternative nonpolluting power sources for automobiles is urgently needed. The only economically alternative power source available as a working and fully developed system is the Rankine-cycle external combustion engine which uses steam or vapors as the working fluid. The Lear water vapor engine, the water turbine of the Thermodynamic Systems Inc., a turbine water-vapor engine, the Thermo Electron Corporation system, and Williams and Keen automobiles are explained. The major merit of the external combustion engine is that it is almost completely free of emissions. In addition, the engines show excellent torque patterns at low speeds, eliminating or simplifying transmission. The potential of the Stirling engine, which can be operated by nuclear or solar energy is also discussed. This engine is especially advantageous for noise control.

757 APTIC NUMBER 17353

Yanagihara, Shigeru
PROBLEMS OF VEHICLE EMISSIONS AND ENGINE MODIFICATION. (Kazin no kozo oyobi sokojoken karamita jidosha haikigasu no shomondai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(4): 239-244, April 15, 1966.

The problem of vehicle emissions attracted special interest because of air pollution. The gasoline engine uses gasoline fuels and ignites them with an electric plug. The diesel engine differs from the carburetor engine in that only air is admitted

during the intake stroke of the piston. When the piston completes the compression stroke, the air is compressed to a high temperature in the cylinder. It is only necessary to ensure that air is present to supply the oxygen required for combustion. The hydrocarbon fuels used in the internal combustion engine consist mainly of mixtures of carbon and hydrogen compounds contained in crude petroleum. The air-fuel ratio in the mixture admitted to the cylinder of a gasoline engine must be controlled within accurate limits in order to assure a homogeneous mixture through which the flame will travel at a uniform rate after ignition by an electric spark. A high air-fuel ratio is desirable. Sulfur in the fuel will form sulfur dioxide during the combustion process. A rigid limitation is set on the sulfur content of fuels. In the four-stroke-cycle engine, higher air-fuel ratios can be employed because of acceleration and fixed speeds. It is impossible to improve the pollutant concentration because of deceleration or idling. The density of automobiles is high at crossroads. In every city, idling is quite common in these circumstances. There are many difficulties in the way of a solution to the idling problem, but it is not as difficult from the theoretical or practical point of view.

758 APTIC NUMBER 16899

Aho, William O.
THE JENSSEN EXHAUST SCRUBBER--AN EFFECTIVE AIR PROTECTION SYSTEM. Tappi, 52(4):620-623, April 1969. 5 refs.

A system incorporating a bubble cap tray absorption column was designed and installed to recover SO2 from two Jenssen tower exhausts. With this system the exhaust gases are scrubbed with a sodium hydroxide--sodium bisulfite solution, and the resulting liquor is used in a neutral sulfite--chemimechanical pulping process. Potential problems stemming from SO3, and CO2 in the gases were evaluated. Other types of scrubbers were examined. The design procedure for the scrubber is reviewed and a description of the recovery process is included. Both a source of air pollution and economic loss were eliminated. (Author's Abstract)

759 APTIC NUMBER 11773

Asset, Gabrielle, David Kimball, and Milton Hoff
SMALL-PARTICLE COLLECTION EFFICIENCY OF VERTICAL CYLINDERS IN FLOWS OF LOW-INTENSITY TURBULENCE. Chemical Research and Development Labs., Edgewood Arsenal, Md., Projs. 1A014501A91A, 1B522301A060, EATR 4225, 45p., Jan. 1969. 8 refs.

The collection efficiencies were studied of paper-coated glass and copper cylinders in a wind tunnel in which the flow was turbulent. The material collected was dibutyl phthalate droplets of MMD 1.3 micron. The velocities of the air flow were 16.8, 12, and 8.3 mph, and the cylinder diameters were 7.5, 4.0, and 2.0 cm. Using these particle sizes, wind velocities, and cylinder sizes, deposition by inertial impaction was precluded. It was found that the collection efficiencies were less than 1% in all cases, but were greater for the paper-coated glass cylinders than the paper-coated copper. Collection efficiency, in general, increased with the reciprocal of the cylinder diameter and was greater at 16.8 mph, than at 12.0 and 8.3 mph. At the intensities used (0.5, 1.8, and 4.7%), turbulence had no effect on collection efficiency. (Author abstract modified)

760 APTIC NUMBER 12516

Atkisson, Arthur A., Jr.
NATIONAL MOTOR VEHICLE CONTAMINANT CONTROL REQUIREMENTS: AN EVALUATION OF 'BLOWBY' CONTROLS AS A MEANS OF REDUCING VEHICULAR CONTAMINANT EMISSIONS. Preprint, Air Pollution Control Association, New York City, 18p., 1961. 27 refs. (Presented at the Air Pollution Control Association Annual Meeting, 54th, New York, June 1961, Paper 61-90.)

One of the currently available techniques for reducing total vehicular contaminant losses involves the use of blowby controls to prevent emissions from crankcase vents and breather tubes on gasoline-powered motor vehicles. Two alternative blowby control devices were installed on approximately 100 vehicles owned by Los Angeles County and their performance evaluated in road draft tube tests. One device consisted of a variable orifice valve and vent tube system which vents the crankcase fumes to the intake manifold. The second consisted of a tube which vents the fumes from the crankcase directly to the carburetor air cleaner. The first type costs from five to ten dollars; the second costs approximatley one-fifth of that amount. During the evaluation program, more than two million road miles were accumulated on the test vehicles. There were no complaints about the test devices. No sticking or plugging of the variable orifice valves occurred. No adverse engine operating conditions were reported as the result of drawing blowby fumes through the carburetor. The lack of complaints is attributed to the fact that a fuel oil used possessed a detergent. Either of the two device systems is capable of meeting the California crankcase emission standard which requires an approximate 80% control of blowby losses. However, a combination of the two types would result in a control system with virtual 100% efficiency. Such a system would also minimize the probability of control failure resulting from the clogging of a single vent tube or orifice valve, thereby detering the need for an official inspection program.

761 APTIC NUMBER 12442

Atsukawa, Masumi
CONTROL AND REMOVAL OF SULFUR FROM THE FLUE GAS OF A LARGE SCALE COMBUSTION PLANT. DRY PROCESS OF SULFUR OXIDE REMOVAL FROM FLUE GAS, USING ACTIVATED MANGANESE OXIDE. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):37-38, 1967. Translated from Japanese. 8p.

An activated manganese oxide absorption process for removing sulfur oxide from flue gases was investigated with successful results in pilot-plant studies conducted by two power companies. The process, which removes both SO2 and SO3 and yields ammonium sulfate, combines absorption with dust precipitation, absorbent regeneration, and ammonium sulfate crystallization. Homogeneous dispersion of the pulverized absorbent is obtained by mixing it first with a part of the main flow of gas and then adding it at high speed to the main gas flow. Since the tower contains no filler, power requirements are reduced. Manganese sulfate formed during the reaction, together with unreacted manganese oxide, flue-gas soot, and ash, are collected in a multicyclone and electrostatic precipitator. The collected materials are returned either to the absorbing tower or are converted to slurry for use in the regeneration process. The absorbent is regenerated in the oxidation tower by treating the slurry with aqueous ammonia under about 5 atm air. The slurry discharged from the oxidation tower is separated into an ammonium sulfate solution and recovered absorbent. The former is then introduced to the crystallization process and the latter is reintroduced to the absorption process. An advantage of the method is that the structure and capacity of a boiler are unaffected, since the process is applicable to normal flue gas temperatures.

762 APTIC NUMBER 18062

Avery, D. A. and D. A. Boiston
THE RECOVERY OF SOLVENTS FROM GASEOUS EFFLUENTS. Chem. Engr.

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(London), No. 225, CE8-11, Jan. - Feb. 1969. 6 refs.

The paper summarizes the types of gaseous effluent and discusses methods used to combat these. A discussion of the use of adsorbents for this purpose is followed by the main section of the paper which deals with the removal and recovery of volatile organic solvents on active carbon, both in fixed bed and fluid bed applications. (Author's Abstract)

763 APTIC NUMBER 11985

Babcan, J. and L. Krejcirik
GAINING IRON FROM POWER PLANT ASHES. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 111-118.

Magnetic iron concentrates were experimentally isolated in granulation combustion chambers from the ashes produced by coal-burning power plants. Laboratory as well as model magnetic separation tests were performed and data was obtained on the possible utilization of power plant ashes as metallurgical raw material. For a nearly quantitative isolation of magnetically separable iron compounds, a magnetic field of relatively low intensity (1.000 Oe) was sufficient. The total concentrate yield depends on the coal used and the manner of its combustion. The quality of the obtained iron concentrates is very good, equalling in many cases that of concentrates from the highest quality iron ores. Specific weight of the obtained concentrates is relatively low, due to the globular shape of the individual, hollow granules. The concentrates are suitable raw material for blast furnaces, but, because of their granularity, they must be agglomerated. (Author summary modified)

764 APTIC NUMBER 12391

Bailey, C. L.
THE INFLUENCE OF MOTOR GASOLINE CHARACTERISTICS UPON CARBON MONOXIDE EMISSIONS UNDER ENGINE IDLE CONDITIONS. Inst. of Mechanical Engineers, London (England), Autcmobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 9p. (Nov. 25-26, Paper 16.)

In order to identify the important fuel characteristics influencing carbon monoxide exhaust emissions, five vehicle systems were tested with four experimental fuels which provided variations in viscosity, volatility, carbon/hydrogen ratio, and specific gravity. A fifth, a reference fuel, was included for comparison purposes. Because of the unavailability of test equipment, the experiments were confined to the idle mode only. Full test data are presented. The only influential fuel characteristics was front end volatility defined by R.v.p., volume distillate to 70 C, and/or the temperature difference between the 10 and 20% distillation volumes. The variable jet carburetors examined showed increased CO emissions with increased volatility, whereas the fixed jet carburetor and fuel injection system showed reduced CO with increased volatility. The effect observed in the vehicle fitted with the fixed jet carburetor was very much less pronounced than the effect observed in the vehicles fitted with a variable jet carburetor. Statistically significant laboratory effects of the same order of magnitude as the fuel effects were measured during the test work. (Author conclusions modified)

765 APTIC NUMBER 12504

Baxter, M. C., G. W. Leck, III, and P. E. Mizelle
TOTAL EMISSIONS CONTROL POSSIBLE WITH LP-GAS VEHICLE. Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1968. 13 refs. (Presented at the Society of Automotive Engineers, West Coast Meeting, San Francisco, Aug. 12-15, 1968, Paper 680529.)

A 1966 compact van, converted to operate on LP-gas (propane propylene, and ethane) and evaluated under federal exhaust emissions procedure, approached several definitions of a pollution-free vehicle. The emission measurements made were total hydrocarbons, total carbon monoxide, total carbon dioxide, nitrogen oxides, and aldehydes. Results showed that hydrocarbon and carbon monoxide levels of 126 ppm and 0.3%, respectively, were below the 1968 and 1970 emission limits. Certain LP-gas fuel system designs promise to eliminate all evaporative losses. The exhaust hydrocarbons were 70% less reactive than those in gasoline exhaust. Aldehydes, a highly reactive class of exhaust compounds, were low. Oxides of nitrogen were significantly higher with LP-gas because of operation at maximum economy mixtures and maximum spark power advance. The use of a catalytic muffler and rich LP-gas mixtures produced very low oxides of nitrogen levels with other pollutants being below 1968 limits. More work is needed to establish what minimum levels are possible, what limitations exist for LP-gas powered vehicles, and finally, what pollutant levels are needed for motor vehicles to curb the air pollution problem and how they can be best achieved.

766 APTIC NUMBER 12378

Bishop, B. L. H.
CONTROL OF CRANKCASE EMISSIONS. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 10p. 10 refs. (Nov. 25-26, Paper 3.)

The crankcase can be the source of an average of 25% of total hydrocarbon emissions from an engine unmodified for pollution control; its contribution to total carbon monoxide emissions is extremely small. Controls and legislation affecting crankcase emissions are reviewed; such controls were initiated in California in 1963. The requirements of crankcase control systems and the problems involved are discussed. The approach to control which accepts that blow-by, or engine leakage past the piston and piston rings, will reach the crankcase but aims to limit its emission to the atmosphere is in general usage. All such systems are based on the principle of recirculating the blow-by gases into the induction system of the engine. Three groups are described: systems where blow-by is fed to the induction system upstream of the throttle, to both sides of the throttle, and downstream of the throttle. Of the last group, those controlled pressure ventilation systems which use the diaphragm type valve have a high-cost drawback, but share the advantage of best

performance at full throttle, when adequate ventilation is hardest to achieve, because of the connection to the inlet manifold. Although crankcase emissions from diesel engines are not a pollution hazard, some manufacturers recirculate the crankcase fumes to the induction system to achieve other operating advantages.

767 APTIC NUMBER 11797

Borgwardt, Robert H.
KINETICS OF THE REACTION OF SO2 WITH CALCINED LIMESTONE. Preprint, Cincinnati, Ohio, Public Health Service, National Air Pollution Control Administration, 11p., March 4, 1969. 10 refs.

In an investigation of the limestone injection process for flue gas desulfurization, the rate of reaction of calcined limestone with sulfur dioxide was determined in a differential reactor. The calcined samples were screened into 14/1, 28/25, 42/65, and 150/170 mesh sizes. An Arrhenius plot for each of the four sizes was obtained for reactions between 650-980 C. The apparent activation energy determined from the slope of these plots was distinctly different for each stone, ranging from 8.1 to 18.1 Kcal/gm mole. When rates were measured at higher CaO conversions (up to 20%), the plots shifted toward the abscissa, but remained parallel to the lines, indicating no significant change in the activation energy. The high sensivity of the rate of sorption to temperature suggests chemical reaction is the predominant rate-controlling resistance. Arrhenius plots could not be extrapolated to 540 or to 1100 C. The reaction rate was not proportional to specific particle surface and in some cases was independent of it, suggesting that some reaction takes place within the interior structure of the solid and that the relative importance of the internal reaction becomes greater as the particle size decreases.

768 APTIC NUMBER 12501

Borgwardt, Robert H.
KINETICS OF THE REACTION OF SO2 WITH CALCINED LIMESTONE. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 23p., 1969 (7). 10 refs.

Differential reactor techniques were used to measure the rate of reaction of sulfur dioxide with 4 natural specimens of limestone after calcination at standardized conditions. The rates were measured as a function of SO2 concentration, particle size, and CaO conversion between temperature limits of 450 and 1100 C. A first-order chemical reaction was the predominant resistance limiting the rate of sorption of SO2 by small particles. The activation energy was dependent upon the type of stone and ranged between 8.1 and 18.1 K cal/gm mole. The rate was essentially independent of particle size for mean particle diameter less than 0.03 cm. The results indicated that reaction occurs initially throughout the particle volume under the isothermal reaction conditions studied and the internal diffusion resistance become limiting only after conversion of at least 20% CaO. The reaction rate decreased rapidly with increasing conversion which can be explained by an exponential relationship between the frequency factor and the sulfate loading. (Author abstract modified)

769 APTIC NUMBER 12500

Borgwardt, Robert H. and Thomas A. Kittleman
THE DRY-LIMESTONE PROCESS FOR SULFUR DIOXIDE CONTROL: A FIELD STUDY OF THE ROLE OF OVERBURNING. Preprint, Air Pollution Control Association, New York City, 19p., 1969. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 22-26, 1969, Paper APCA 69-141.)

The results of field tests designed to evaluate the importance of overburning when limestones and dolomites are fed with the fuel to an oil-fired furnace were reported. Samples of lime were collected from the flue gas at various points in the boiler and analyzed to determine the degree of calcination, extent of sulfation, and changes in physical properties related to chemical reactivity. The results showed that the dry-limestone process should not be applied by injection with the fuel; instead, additives must be injected separately to achieve efficient utilization of the limestone. Overburning is at least partly responsible for the low efficiencies found when additives are fed to the burners. The lime produced by injection with the fuel is much less reactive with SO2 than lime that is not calcined in the combustion zone. This loss or reactivity is associated with changes in the physical structure of the stone during calcination in the combustion zone. These physical changes are sufficient to deactivate the lime, regardless of further side reactions with impurities or ash. Additives injected into coal-fired furnaces with the fuel would therefore be expected to yield only less-satisfactory results. Boiler load was found to be an important variable affecting desulfurization when additives were fed with the fuel. This was apparently due to the higher excess air used during low load and is not a result of differences in flame temperature or residence time. Field tests also indicated that there is an optimum particle size as well as an optimum injection temperature. Results showed that injection temperatures somewhat higher than 2400 F would be best for 2-micron particles.

770 APTIC NUMBER 16860

Brandon, John H.
CAN A FUEL TREATMENT PROGRAM CONTROL STACK EMISSIONS. Combustion, 41(4):20-24, Oct. 1969.

Stack emissions are not the major source of air pollution today, however, they do provide a measurable quantity of contamination that can be controlled. Four case histories of plants with representative problems are presented. The use of a blended slurry of the metallic oxides of aluminum and magnesium in a fuel treatment program resulted in a significant reduction in both SO3 and particulate matter. Reductions of 72.5% for SO3 and 76.2% for particulates were achieved with a marked improvement in the Ringelmann observations.

771 APTIC NUMBER 12386

Burt, M. and K. A. Troth
INFLUENCE OF FUEL PROPERTIES ON DIESEL EXHAUST EMISSIONS. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp.

Motor Vehicle Air Pollution Control, London, 1968, 8p. 15 refs. (Nov. 25-26, Paper 11.)

Experiments on the effects of fuel properties on diesel aerosol and gaseous emissions were performed. White and blue smoke after starting were decreased by increasing fuel cetane number or by decreasing the midboiling point, i.e., fuel volatitlity. There was increased black smoke emission with higher boiling point fuels containing aromatic hydrocarbons, but the practical scope for reducing these emissions through fuel changes is limited. Barium-containing fuel additives are effective, but create a secondary pollution hazard. Fuel properties were found to have varying effects on gaseous emissions, but in general changes in the properties of diesel fuels have only a small influence on the emission of pollutants, particularly when compared with the influence of engine design and operating conditions. In practice, the differences in emissions obtainable with commercial fuels will be even smaller than those shown in the experiments described, since other performance requirements have to be satisfied. The diesel engine often shows conflicting fuel requirements for satisfactory operation in its many aspects of performance. These result in a compromise which gives little freedom for changes, principally because the individual properties of diesel fuels are not independent variables. (Author conclusions modified)

772 APTIC NUMBER 12267

Burton, James S.
INFRARED SPECTROSCOPIC STUDY OF GAS-SOLID INTERACTIONS (FINAL REPORT). General Technologies Corp., Reston, Va., Contract PH 86-68-78, 100p., Jan. 1969. 24 refs.

Infrared spectroscopy was applied to the study of gas-solid interactions between sulfur dioxide in a simulated flue gas and various solid adsorbents. In situ spectroscopic studies were conducted in a high-temperature infrared cell up to 300 C. By measuring the integrated intensities of the sulfate absorption band of the reacted product, it was possible to calculate the rates at which limestone adsorbed sulfur dioxide from a simulated flue gas at 262 C. An activation energy of 11.8 kcal/mole was calculated for the adsorption process. These studies combined with the recorded spectra of various limestone samples before and after exposure of sulfur dioxide at 750 and 1800 F showed that the most probable reaction mechanism of samples exposed at 750 F was the adsorption of sulfur dioxide as sulfite and the oxidation of the sulfite to sulfate. At temperatures above 1800 F, the oxidation of sulfite to sulfate was very rapid and only sulfate was detected in the spectrum of the reacted samples. In addition, a proposed design is presented for conducting the infrared studies in the 1600 - 2000 F temperature region. Preliminary investigations were also conducted on the mechanism of dead-burning. The results have shown that the silicates probably play a role in the dead-burning process. (Author abstract modified)

773 APTIC NUMBER 11865

Calvert, Seymour and Mansoor Taheri
DESIGN OF BAFFLED CONDUIT PARTICLE COLLECTORS. Preprint, American Institute of Chemical Engineers, New York, N. Y., 22p., 1965. 4 refs. (Presented at the American Institute of Chemical Engineers Meeting, Houston, Tex., Feb. 11, 1965.)

The particle collection efficiency and pressure drop characteristics of the multiple channel baffled conduit were determined and methods were developed for predicting these factors in industrial design. Experimental investigations of the effects of particle size, conduit geometry, and flow rate were conducted. The capability of cleaning the apparatus and maintaining collection efficiency was established by operating with continuous water addition to the inlet end of the collector. Collection efficiency and pressure drop characteristics were substantially similar to those of single channel models. Water washing kept the baffles free of dust and did not change collection efficiency appreciably from dry operation. The slotted plate construction of the baffle was capable of fairly high efficiency at moderate pressure drop. It can be used to remove entrained liquid or solid particles from gases. The relationship between the number of particle transfer units and pressure drop (or power requirement) is derived from the efficiency and pressure drop relationships. The number of transfer units for a given particle size and power input is a function of collector geometry and not, as suggested by previous investigators, independent of it.

774 APTIC NUMBER 18048

Carsey, E. A.
CENTRIFUGAL COLLECTORS--DESIGN CHARACTERISTICS, APPLICATIONS. Plant Eng., 23(6) 56-58, March 20, 1969.

Most widely used of today's many available dust collecting and separating devices is the centrifugal collector, a cylindrical gravitational device which separates and collects particulate matter from a gas effluent. A basic collector has no moving parts, and without accessories, consists of a cylinder body, bottom cone equipped with particulate outlet, and a top air outlet. Variations in the design are discussed and some applications are cited.

775 APTIC NUMBER 18047

Celenza, G. J.
ANALYZE AIR POLLUTION AT ITS SOURCE. Plant Eng., 23(8) 114-116, April 17, 1969.

When analyzing a pollution problem it is important to consider the whole system from source to exhaust. Major factors affecting pollution treatment are pollutant quantity, composition, toxicity, and dilution. The application of basic engineering principles to reduce the contaminant load and the total flow volume at the source often result in keeping operating costs at a minimum. These principles involve evaluation of: Changes to production processes, reduction of exhaust volume, and improvement of exhaust collection system.

776 APTIC NUMBER 17407

INDIRECT DESULFURIZATION AND DESERT AFFORESTATION. Chem. Economy Eng. Rev., 2(2):21-23, Feb. 1970.

Japan's oil consumption reached 140 million kiloliters in 1969, most of it imported from the Near and Middle East. Heavy oil from these areas contains 30-50% asphalt and 2-3% sulfur. Because the sulfur from the heavy oil, which is used mainly as fuel, is the major source of air pollution in Japan, an increasing number of companies are being forced to change their plant construction sites under pressure from local governments or local populations. Construction of refineries for asphalt removal and utilization in the Near and Middle East would contribute to promoting development projects in these regions and, at the same time, solve the problem of industrial hazards in Japan. Indirect desulfurization is recommended for the utilization of asphalt in developing countries. Heavy oil is separated first into oil and asphalt containing 5-6% sulfur. The oil is treated at a hydrogen pressure of about 100 ata in the presence of a metal catalyst to reduce the sulfur content to 0.3% at the maximum. The refined oil would be exported to Japan and the asphalt retained by the developing country. One use of asphalt is to spread it in a layer two ft below the ground level of a desert or semi-desert area. By cutting off the rise of salt in the ground, the asphalt layer permits the ground above it to be effectively irrigated.

777 APTIC NUMBER 16876

Clement, J. L. and W. L. Sage
AMMONIA-BASE LIQUOR BURNING AND SULFUR DIOXIDE RECOVERY. Tappi, 52(8):1449-1456, Aug. 1969. 23 refs.

The use of ammonia-base for sulfite pulping requires consideration of waste liquor burning and sulfur dioxide combustion product recovery. Burning tests in a pilot unit demonstrate liquor can be burned at stable combustion conditions without supplementary fuel where the solids content of the liquor exceeds 50% and air temperature 550 F, and establish parameters for the projected design of a commercial liquor atomizer and water-cooled furnace to burn ammonium liquor. Reported SO2 absorption experience provides information to design a system for SO2 recovery at a temperature of about 100 F; more economical design at the flue gas dewpoint temperature requires additional knowledge of the effect of temperature on absorption system parameters. (Author's Abstract)

778 APTIC NUMBER 18028

FLY ASH GOES COMMERCIAL. Coal Age, 74(4):64-69, April 1969.

Fly ash removed at the stacks as an air pollution control measure represents a potential source of useful products that can be of great importance to the economics of coal-fired power plants and the coal industry. Reclamation of the fly ash has been hindered by the fact that the composition and other qualities of fly ash are not consistent. A prototype plant is described that will provide for total utilization of 450 tn/d of fly ash regardless of the source or properties of the feed. The basis of the process is the separation of the fly ash into consistently reproducible fractions which are then individually converted into useful commercial products. The major products obtained are: A fine pozzolanic fraction for use as cementitious material in concrete; an iron concentrate for use in the cement, coal, and steel industries; a sinter feed fraction to be used for the sintering of light weight aggregate pellets; a carbon fraction that is valuable in a number of industries.

779 APTIC NUMBER 16851

Cortelyou, C. G.
COMMERCIAL PROCESSES FOR SO2 REMOVAL. Chem. Eng. Progr., 65(9): 69-77, Sept. 1969. 5 refs.

Several stack gas sulfur removal processes have a potential for the economic, efficient removal of sulfur compounds before they enter the atmosphere. These processes are the subject of a study made by GCA Corporation of Bedford, Mass. for the American Petroleum Institute. More than 20 processes are classified as first generation, near first generation, and second generation processes based on the stage of their development both technical and economic. The four first generation processes which are examined more closely in this study include: Combustion Engineering's Dry Dolomite Injection with Wet Scrubbing, Monsanto's Catalytic Oxidation Process, U. S. Bureau of Mines Alkalized Alumina Process, and the Reinluft Dry Char Absorption Process. Flow diagrams are included for each of these processes. An 800 megawatt power plant was considered as a basic unit for comparison of the processes. It was assumed that such a unit with a 60% load factor would require 6 mill bbl/yr of heavy fuel oil containing 3% S, a stack gas temperature of 250 F, and power, water, and labor costs felt to be representative of U. S. industry. The Dolomite Injection Process has both the lowest capital costs and the lowest operating costs. In addition to comparing the economics of each process, the effect of changing variables in the assumptions is also examined. Since all of these processes are in a transitory state of development results of demonstration projects will help to evaluate the processes.

780 APTIC NUMBER 12410

Coutant, R. W., J. S. McNulty, R. E. Barrett, J. J. Carson, R. Fischer, and E. H. Lougher
INVESTIGATION OF THE REACTIVITY OF LIMESTONE AND DOLOMITE FOR CAPTURING SO2 FROM FLUE GAS. (SUMMARY REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Contract PH 86-67-117, 67p., Aug. 30, 1968. 16 refs.
CFSTI: PB 180834

An experimental reactor was designed, constructed, and used for determining rates of reaction of various limestones and dolomites with sulfur dioxide under conditions that simulate localized conditions in a conventional power-generating boiler. The rate of reaction of one stone (BCR-1359) was determined as a function of residence time (0.2-1.0 sec), temperature (1500-2150 F), SO2

concentration (0.1-0.3 volume%), and particle size (70-325 U. S. Standard mesh). A total of 25 limestones and dolomites were screened by the reactor. With BCR-1359, an apparent activation energy of 28 kcal/mole was found for the SO2 reaction. The high activation energy seemed to rule out film diffusion as a rate-controlling mechanism. Reactor studies on the additional 24 stones indicated that the range of reaction rate was not large enough under the conditions employed. No correlation was found between the reaction characteristics and the results of chemical and mineralogical analyses. Subsidiary experiments performed in a microbalance system were used to characterize the reaction behavior of precalcined specimens of limestones and dolomites in a long-term, low-temperature reaction domain. The results showed that various limestones and dolomites exhibit similar temperature dependencies for the reaction capacities, with maximum capacity at 1300 F. It was concluded that differences in capacity among various stones at a given temperature are not due primarily to variations in chemical behavior. The reaction rate of BCR-1359 was indicated to be first order with respect to SO2 concentration by both reactor and microbalance studies. The microbalance results indicate that the chemistry of the reaction between limestone and SO2 is quite complex. Sulfite is formed initially when the oxygen concentration is low, but the sulfite is converted to sulfate either by reaction with oxygen or by a disproportionation-type reaction. Even at high oxygen levels, sulfite probably is the initial reaction product, with sulfate formation resulting from rapid secondary reactions. (Author summary modified)

781 APTIC NUMBER 11884

Crocker, Burton B.
MINIMIZING POLLUTION CONTROL COSTS WITH ENGINEERING PRINCIPLES. Preprint, Air Pollution Control Association, New York City, 21p., 1968. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 61st, St. Paul, Minn., June 23-27, 1968, Paper 68-133.)

Pollution control costs can be reduced by application of a fundamental engineering analysis rather than a hunt-and-try approach. A systems approach is necessary to minimize both manufacturing equipment and pollution control equipment cost, and operating cost. A systematic approach to solution of pollution problems within the systems analysis is presented. Examples of the coupling of fundamental principles and ingenuity are included. Examples are given related to minimizing the quantity of contaminant produced and released for cases of solid particulates, gases, and mists. Minimization of the effluent through careful hood design, by reducing the inert components, through recycling and by reduction of gas volume by cooling is also reviewed. The need for keeping in mind fundamental engineering principles in the design of control equipment is stressed. (Author abstract modified)

782 APTIC NUMBER 12379

Dartnell, P. L. and P. V. Lamarque
THE EFFECT OF COMBUSTION CHAMBER SHAPE AND OTHER ENGINE DESIGN FACTORS ON EXHAUST EMISSIONS. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 12p. 11 refs. (Nov. 25-26, Paper 4.)

A Heron combustion chamber engine of 2-liter capacity was utilized to investigate the effect of combustion chamber shape, increased mixture movement, valve timing, mixture formation, and reaction in the exhaust system on engine performance and level of exhaust emissions using the seven-mode U. S. Federal cycle. One of the [illegible] examined (at 12/1 compression ratio) appeared the most promising for power economy and low emissions. When installed in the vehicle, weighted average values for hot cycle emissions of approximately 320 ppm for hydrocarbons and 1.7% for carbon monoxide were obtained. The composite value for both cold and hot cycle emissions was about 360 ppm HC and 1.4% CO. By the use of twisted tape in the inlet ports, the composite value was reduced to 330 ppm HC. Exhaust emissions were not reduced for the cycle with high rates of directional swirl imparted to the mixture entering the combustion chamber, or by eliminating the valve overlap period. Significantly lower unburned HC emissions were obtained by supplying heated air to the intake system. Initial results appear to indicate that reduction in HC and CO may be possible through increased exhaust gas back pressure and temperature. (Author conclusions modified)

783 APTIC NUMBER 12392

Dodd, A. E. and J. W. Wisdom
EFFECT OF MIXTURE QUALITY ON EXHAUST EMISSIONS FROM SINGLE-CYLINDER ENGINES. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 16p. 2 refs. (Nov. 25-26, Paper 17.)

Tests of the effects of fuel mixtures on the composition of exhaust gases were performed on 325 cu cm- and 479 cu cm-capacity engines. On the 325 engine, the most noticeable effect of an improvement in mixture quality was to extend the weak limit. Hydrocarbon levels at full throttle and half load were lowest with the fully vaporized mixture and carburetor respectively. Differences in emissions between the four main systems were not great, however. Ratios of total to N.D.I.R. HC varied with mixture strength and reached a maximum at or near to stoichiometric air/fuel ratio. Nitric oxide emissions at full throttle peaked at about 16/1 air/fuel ratio and the peak moved towards stoichiometric mixture strength as the load was reduced. Minimum mass emissions of HC occurred at an air/fuel ratio of about 16.5/1, near to the peak of NO emission. CO levels at a given air/fuel ratio were higher with the fully vaporized mixture at full throttle than with any other system. On both engines, an increase in engine speed produced a reduction in HC emissions; CO variations with speed differed between engines. The effect of an increase in mixture temperature in the range 35-95 C was generally negligible. Residence time effects varied with fuel supply system; the better the atomization of fuel, the shorter the residence time for minimum emissions. At half load with dry mixtures and port injection, retarded ignition timing produced a reduction in emissions. (Author conclusions modified)

784 APTIC NUMBER 12385

Dowling, E. W.
PRACTICAL EMISSION CONTROL SYSTEMS: PETROL INJECTION. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 8p. 6 refs. (Nov. 25-26, Paper 10.)

The requirements and techniques of emission control on petrol injection engines are similar to those for carburetor engines; the differences are in the fuel metering, atomization, induction system, and ancillary devices used for fuel cut-off control during deceleration. Such a system delivers accurately metered charges of fuel to each cylinder port in the form of a finely atomized spray. The air charge picks up the fuel, on the induction stroke, in a region of some heat within the water-jacketed inlet port, where the two are mixed and finally passed into the cylinder. Further mixing and heating takes place until the moment of ignition, for induction- and compression-included turbulence also play an important part in the mixing process. For emission control, the major factors are the timing and the disposition of the fuel spray within the manifold and port. Driveability at the lean air/fuel ratios where emissions are lowest, maintained in this mixture range during part throttle accelerations, is an important advantage of petrol injection engines. The fuel system, engine calibration and fuel control settings, and manifold vaccum limiting devices are discussed. When the increased power that occurs with petrol injection comes solely from removal of restrictive losses in the intake system, the power gain can be available without any loss in emission performance. Developments have not yet reached the stage, however, where engines developing the most power can be 'clean' with petrol injection; the present advantages is about 6% in maximum road speed over that obtained with a 'clean' engine.

785 APTIC NUMBER 16853

Edwards, Franklin J.
CATALYTIC VS THERMAL AIR-POLLUTION CONTROL. Contam. Control, 8(9):10-13, Sept. 1969.

One of the best ways to control an air pollutant is to burn it before it reaches the atmosphere. The two methods of combustion used in air pollution control systems, catalytic oxidation and thermal incineration, are compared. For some systems, thermal incineration is the only solution, however when a choice is available, several advantages can be cited for catalytic oxidation. Lower operating temperatures, faster reaction time, and increased stream flow rate are among the advantages of catalytic oxidation discussed.

786 APTIC NUMBER 16854

Elliott, J. F. E. and A. G. Franks
DESIGN OF TELEPHONE EXCHANGES FOR CORROSIVE ATMOSPHERES. Corrosion Prevent. Control, 16(4):12-15, Aug. 1969.

The atmosphere in Rotorua, New Zealand, at the center of a region which is remarkable for great geothermal activity, has a high hydrogen sulfide level. Precautions to protect telephone equipment installed in this area from corrosion are discussed. The possible approaches to achieving a technically and economically satisfactory solution are: Application of air purification to equipment within an enclosure; application of special finishes to standard components; use of alternative materials.

787 APTIC NUMBER 11671

Hanson, D. N. and C. R. Wilke
ELECTROSTATIC PRECIPITATOR ANALYSIS. Preprint, California Univ., Berkeley, Dept. of Chemical Engineering, 34p., 1968 (?). 6 refs.

The space charge precipitator operates on the principle of mutual repulsion of charged particles to a grounded wall, and is capable of a high collection efficiency. A comparison between space charge precipitators and conventional electrostatic precipitators is based on equations derived for one size of particle, although, if the space charge of particles is small, they apply to systems of any particle-size distribution. Results of theoretical analysis show that the space charge precipitator has wall area requirements similar to conventional units, provided the drops added to the gas are of the same general size as the particles to be precipitated. Space charge precipitators are considerably simpler in construction than conventional units would be highly desirable if the production of large quantities of small drops can be achieved. Present designs of atomizing nozzles are not satisfactory for this purpose but condensation of steam to form droplets appears feasible. In order to examine the magnitude of equipment necessary and the general feasibility of space charge precipitators, an example of each type is calculated. (Author abstract modified)

788 APTIC NUMBER 12382

Harris, B. V. and H. I. Fuller
CONTROL OF EVAPORATIVE EMISSIONS OF FUEL FROM MOTOR VEHICLES. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 8p. (Nov. 25-26, Paper 7.)

The evaporative emissions from a vehicle totally unmodified for pollution control comprise as much as 15% of the total emissions of pollutants from that vehicle; the Evaporative Loss Control Device (E.L.C.D.) for reducing automotive fuel tank emissions of hydrocarbons is described. Using a controlled adsorption-desorption cycle in a solid adsorbent system, the E.L.C.D. traps those hydrocarbon vapors emitted from the carburetor and fuel tank which would normally be lost to the atmosphere. It later allows the controlled consumption of these trapped vapors by the engine in a manner which neither alters the operability of the vehicle nor adversely affects the controlled exhaust emissions of unburned hydrocarbons, carbon monoxide, and nitrogen oxides. The original or 'classical' E.L.C.D. consists of a canister containing the adsorbent bed, a pressure balance valve, and a purge control valve. Durability of the valves and adsorptive bed has been confirmed over many thousands of miles. Even after 8000 repeated loadings and purgings, there was no evidence of a decrease in adsorptive capacity. Conformity with the U. S. Federal requirement of 6 g maximum evaporative loss is readily achieved,

with no adverse effects on exhaust emissions.

789 APTIC NUMBER 17342

Hashimoto, Kiyotaka
THE POINT OF PLANNING AND ITS EFFECT ON OPERATION RESULT OF AN ELECTRIC PRECIPITATOR IN VARIOUS INDUSTRY SMOKE ABATEMENT (I). CHARACTERISTICS OF ELECTRIC PRECIPITATION AND THE POINT OF ITS EFFECTIVE OPERATION. (Gyoshubetsu ni miru denki shujin sochi no setsubi keikaku to untenkoka (I) -- denki shujin no tokucho to kokateki toriatsukai no yoten). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(8):547-562, Sept. 15, 1966.

Properties of smoke generated from various kinds of operations are quite different when considered from different viewpoints. Before planning for control equipment and its effect on operations the following factors must be understood: results in industrial smoke abatement, the characteristics of electric precipitation, properties of smoke, and the effect of various constructional factors. Electric precipitation operations was outlined. A mechanical precipitator acts on each particle of smoke dust; it is economically impossible to precipitate minute particles smaller than 10 micron. In an electric precipitator, the electrostatic cohesive action works effectively; minute particles adhere to comparatively large particles by the electrical force and are precipitated with them. Good precipitation results are projectable by strengthening the electrostatic cohesive power and enlarging the scale of the electric precipitator. The necessary electricity for precipitation and loss of ventilative power is very small. The small change of ventilative power loss with time also gives stability in the combustive operation. There are two kinds of electric precipitative forces: the gradient-force and the Coulomb-force. The effect of a gradient-force becomes quite low when the precipitative voltage is sufficiently high and corona discharge takes place frequently. Effective precipitative voltage has a maximum value with a certain discharge frequency. The discharge frequency which gives the maximum effective precipitative voltage is a unique value for each electric precipitator. The best way of operation is with a discharge frequency. Generally, the form of the precipitators makes little economical difference when they cope with smoke of ordinary properties. Graphs which give economical information were presented.

790 APTIC NUMBER 17343

Hashimoto, Kiyotaka
THE POINT OF PLANNING AND ITS EFFECT ON OPERATION RESULT OF AN ELECTRIC PRECIPITATOR IN VARIOUS INDUSTRY SMOKE ABATEMENT (II). TREATMENT FOR WASTE GAS OF A COMBUSTION FURNACE AT A THERMAL-POWER PLANT (I). (Gyoshubetsu ni miru denki shujin sochi no setsubi-keikaku to untenkoka (II) --- karyoku hatsudensho no nenshoki haigasu no syori (sono 1)). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(9):657-663, Oct. 15, 1966.

In Japan, coal-burning, heavy-oil-burning, or coal-oil-burning was adopted for industrial thermal-power generation. Fall-out, aerosols, and poisonous gases are considered in smoke pollution prevention. Powdered coal is used for coal-burning thermal power generation in great capacities and stoker-type furnaces are not used. This is one reason for so much smoke dust. The properties of smoke and the amount used in a powdered-coal-burning boiler are influenced considerably by various factors. The precipitation percentage must be maintained at 96-98%. Previously, the smoke of a thermal-power-generation boiler was not regarded as an object of smoke prevention, and precipitators were not operated. Now, the utility value of fly-ash is appreciated, and at almost all thermal-power plants, the precipitators for fly-ash production are being used. Fly-ash is chemically stable and is satisfactorily strong for use as concrete fillers. Various types of precipitators for fly-ash production were described. A multi-cyclone with a high precipitation efficiency or an electric precipitator are usually used as precipitators for smoke pollution prevention at thermal-power plants. Other types cannot be used because of the high temperature and the large amount of waste gas. A multicyclone has little effect on precipitation of aerosols. As thermal-power generation grows to a larger scale, the development of a technique to make the precipitators smaller and more efficient is urgent.

791 APTIC NUMBER 17402

Hashimoto, Kiyotaka
THE POINT OF PLANNING AND ITS EFFECT ON OPERATION RESULT OF AN ELECTRIC PRECIPITATOR IN VARIOUS INDUSTRY SMOKE ABATEMENT (V) -- AIR POLLUTION IN CERAMIC INDUSTRY. (Gyoshubetsu ni miru denkishujinsochi no setsubikeikaku to untenkoka (V) -- Yogyohin seisan ni tomonau haigasu no jogai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(3):165-174, March 15, 1967. 28 refs.

Dust generated in the manufacturing of cement is high in electric resistivity and has an erosive property. A rotary dryer generates high amounts of dust whose apparent resistivity varies considerably with the treatment of the raw material. A rotary kiln generates dust the apparent resistivity of which is high. By considering such variabilities, an effective dust collecting system can be designed. Dust generated by a packer is a part of the final product and has to be precipitated and collected by a special dust collector. An electric precipitator is usually controlled by reading the voltage of the transformer and the amperage of the discharge-amperemeter. For the most effective operation of the precipitator, a precipitative voltmeter has to be used. The spark-count controlling method can be adopted for the dust of low resistivity. Plumes or smut result when precipitating efficiency is not satisfactorily high. In the carbonic industry, the production of electrodes for metal refining and other purposes and the production of carbon black have to be considered first with respect to air-pollution prevention. Dust generated in the manufacturing of electrodes is low in electric resistivity, has little cohesive power, and contains some higher-boiling hydrocarbon; thus, a stabilizer is necessary. Dust generated in the manufacturing of carbon black can not be precipitated by an electric precipitator because of its special properties, but it can be precipitated by a special unit system of dust collectors. In other parts of the ceramic industry, it is easy to precipitate dust by an electric precipitator, but most of the factories are small in scale so special methods of treatment are necessary.

792 APTIC NUMBER 17403

Hashimoto, Kiyotaka
THE POINT OF PLANNING AND ITS EFFECT ON OPERATION RESULT OF AN ELECTRIC PRECIPITATOR IN VARIOUS INDUSTRY SMOKE ABATEMENT (IX) -- TREATMENT OF EXHAUST GAS FROM REFUSE INCINERATOR. (Gyohshubetsu ni miru denkishuhjin sohchi no setsubikeikaku to untenkohka (IX) - Jinkai shohkyaku no tomonau haigasu shori ndao). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(9):543-548, Sept. 15, 1967. 11 refs.

Urban refuse includes many inorganic containers and vinyl bags that present difficulties with respect to perfect combustion. In Japan, the choice of incineration by equipment and incinerating schedules is left to each municipality independently; an 8 hr/day operation is common. In such cases, imperfect combustion interferes with the performance of dust collectors when they start or stop operations, and odorous waste gas emissions are inavoidable. Corrosion of the installations and damage by the heat-cycle are increased by Cl2, NH3, SO2, SO3, etc.. Consequently, a 24 hr/day operation plan with standardized equipment is advisable. For adequate combustion, O2-rich air should be used. Most recently constructed incinerators employ the following types of treatment: flow rate is controlled by a continuous dust-feeding method; dry waste gas is resolved and the odor removed through high-temperature combustion area in incinerators; temperature of the combustion waste gas is controlled, and dust removed by dry methods. Because of the wide variety of refuse in Japan, little progress has been made in standardizing incinerator operations. It is necessary to set up pretreatment installations and to improve dust removal installations.

793 APTIC NUMBER 17406

Hashimoto, Kiyotaka
THE POINT OF PLANNING AND ITS EFFECT ON OPERATION RESULT OF AN ELECTRIC PRECIPITATOR IN VARIOUS INDUSTRY SMOKE ABATEMENT (VII). TREATMENT OF FLUE GAS AT REFINERIES (II). (Gyohshu betsu ni miru denki shuhjin sochi no setsubi keikaku to unten koka (VII) -- seirenjo ni okeru haigasu no shori (II). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(6):359-364, June 15, 1967. 3 refs.

Selenium and its compounds are valuable but poisonous industrial materials. Therefore, in electrolytic refining, it is necessary to undertake effective recovery measures not only for Se recovery, but also for the prevention of air pollution. In recovering Se from slime in the smelting of copper, it is desirable to cool and remove harmful dusts by wet electric precipitation processes; it is difficult to remove these dust from the precipitation electrode by rapping. As mercury has a dangerous vapor pressure at room temperature, smelting operations require careful supervision. Mercury is recovered in the form of mist after heating decomposed cinnabar; dust is removed in hot vapor condition. Mercury carried away by the drainage system can be easily recovered by the use of a discharge system. In molten electrolytic smelting, alumina dust and fluorine compounds are generated by the production of aluminum and Cl2 gas by the production of Mg. In the electrolytic smelting of Al, alumina, cryolite, and aluminum fluoride are electrolyzed in the electrolytic furnace, preventing materials from boiling and scattering with carbon paste. Among the components of dust, F and Na are not easily precipitated, in comparison with Al2O3, and are apt to be concentrated in the after-dust-collector. Many ores are utilized in the production of sulfuric acid. Sulfur dioxide gas is removed by electric systems. Sulfur dioxide as low as 0.5% can be recovered by the present technology, but for SO2 gas below 0.2%, electric systems are the only alternative. To raise the efficiency of a sulfuric acid plant, it is desirable to maintain a high temperature in blast furnaces. For this reason, furnace frames should be steel.

794 APTIC NUMBER 17388

Horvath, Helmuth and August T. Rossano, Jr.
TECHNIQUE FOR MEASURING DUST COLLECTOR EFFICIENCY AS A FUNCTION OF PARTICLE SIZE. J. Air Pollution Control Assoc., 20(4):244-246, April 1970. 3 refs.

In evaluating the performance of dust collectors, it is sometimes necessary to determine their removal efficiency as a function of particle size. With a specially designed generator, producing an aerosol of concentration, chemical composition, and size distribution similar to incinerator aerosols, a wet scrubber was tested in the laboratory by sampling before and after the collector. Using an Andersen sampler as a seven-stage cascade impactor, the efficiency of the scrubber for seven different particle-size classes was determined. The method provides a fast and simple evaluation of air cleaning device, since no particles have to be counted and sized. The multistage impaction classifies particles according to their aerodynamic behavior, and the concentration of the deposit is subsequently determined by weighing the deposit. No specific requirements are necessary for the test aerosol used, except that it should have the same affinity to the scrubbing liquid as the aerosol to be collected in actual application. The data thus obtained allow for the calculation of the total efficiency for any other aerosol if its size distribution is known.

795 APTIC NUMBER 17328

Inoue, Shonosuke
SMOKE FROM OIL BURNING. (Juyu nensho no baien ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 1(5):299-304, Jan. 15, 1965.

The most hazardous gaseous pollutants from oil burning in their effect on atmospheric pollution are carbon monoxide and sulfur dioxide. This paper deals with the chemical reactions of CO and SO2 in the combustion process. Successful control of CO and SO2 generation is in part dependent on the quantity of oxygen supply, since their generation results from an oxygen shortage. Prompt vaporization and ignition are necessary for the proper mixture of oil and oxygen. Three methods conducive to good oil burning are to supply sufficient oxygen; to mix oil and oxygen rapidly and in a proper ratio; and to transform oil into an aerosol state. The first method appears the easiest, but excessive oxygen can lower furnace temperature, reducing the rate of heat efficiency and transforming SO2 to SO3. The second method, which is concerned

with control of air quantity, requires that air be mixed with oil in a minimum time period and the consumption of a maximum amount of air. This is regarded as the most important factor for reducing SO2 emissions. The third method involves the problem of making minute aerosol particles from oil, since successful burning is related to particle size. The smaller the oil particles, the less the time and oxygen required for efficient burning. It is concluded that the efficiency of an oil burner reflects and even reinforces successful burning and that the thickness of chimney, rather than its height, is decisive for the flexible control of air inflow at the very moment of oil burning.

796 APTIC NUMBER 12485

Ishihara, Yoshimi
LIME PROCESS OF SULFUR DIOXIDE REMOVAL FROM FLUE GAS, USING THE LIME INJECTION METHOD. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):41-42, 1967. 6 refs. Translated from Japanese. 8p.

The limestone injection process for removing sulfur dioxide from flue gas is reviewed and conditions required for increasing the reaction rate are described. The reactivity of limestone toward sulfur dioxide is estimated from the ratio of lime converted to calcium sulfate to the total calcium oxide formed; the amount of lime converted is measured by chemical analysis of the powder after its passage through the reaction temperature region. In the tests reported, lime reactivity was almost constant when injection was made within 900 to 1200 C. Above 1250 C, the reaction with sulfur dioxide did not proceed at the theoretical rate; below 900 C, calcium carbonate did not decompose. The best results were obtained using finely pulverized limestone containing more than one percent iron and dispersing it homogeneously in the combustion gases at 1000-1200 C. Advantages of the process are its low cost compared to other sulfur removal process and the fact that the injection can be initiated and terminated at any time. Disadvantages are the difficulty in obtaining an extremely high rate of sulfur dioxide removal and the need of an apparatus to remove solid precipitation.

797 APTIC NUMBER 17395

Ishikawa, Keiichi and Syunzi Otobe
ODOR REMOVAL BY METHOD OF CONTACT OXIDATION CATALYSIS, ESPECIALLY ON CATALYTIC COMBUSTION SYSTEM. (Sesshoku sankashokubaiho ni yoru akushu jokyo no oyorei -- catalytic combustion system o chushin toshite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(7):487-489, Aug. 15, 1966.

The reliability of removing odors by contact oxidation catalysis was qualitatively determined by gas chromatographic analysis. The following conditions are imposed on the method: odorous compounds must be completely oxidized; the odor-bearing atmosphere must be mixed with a sufficient quantity of oxygen and the speed of catalysis contact must be regulated; the amount of gas can not exceed the catalytic faculty; the chemical reaction requires gas to be preheated to bring about catalysis at the right moment, combustion heat for combustible components contained in the gas should be less than 110 k cal/cu nm. Compounds reacting to a platinum-alloy catalyst are phosphorus, chlorine, lead, zinc mercury, arsenic, silicon bromine, and solid state accretions which adhere to catalyst surface. The temperature limit of the catalyst is around 650 C, the catalyst must be kept away from the flame. The catalyst facility resembles an air filter, since it is surrounded by stainless-steel frames and wire gauge and inside the frame, the activated platinum is attached to alloy ribbons for convenient handling. A platinum alloy catalyst is suitable for coasting furnaces, separate or continuous processing systems, high-pressure waste gas, over-all treatment systems, and waste incinerators. Flow diagrams presented in this paper illustrate the catalytic combustion system for each application.

798 APTIC NUMBER 17416

Japan Investigation Committee for General Energy Source, Sulfur Control Section
REPORT ON SULFUR EMISSION CONTROL PROGRAM. (Teiiouka taisaku hokokusho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(3):140-147, March 25, 1970.

Essential countermeasures for control of the sulfur emissions are contingent on the supply of heavy oil with a low-sulfur content. The process of shifting to low-sulfur oil will eventually bring about a change in the oil supply-and-demand structure to which responsible bodies are urged to respond. With regard to structural change, the dependence of Japan on heavy oil from the Middle and Near East requires an all-round national program concerned with every aspect of industrial development. The general goals of the program are the selection of economically feasible methods of controlling sulfur emissions, recovery by industry of the costs of control, the development of flexible attitudes toward eventual changes in the national economic structure and toward technical advances, and recovery of commercially profitable by-products. Problems regarding the supply of low-sulfur oil and fluctuation in its price are closely related to any increase in imports of low-sulfur oil and require governmental consideration. Imports of low-sulfur heavy oil currently account for half of Japan's oil supply. This trend in fuel usage should be paralleled by continuing promotion of sulfur control techniques, such as the raw cooking of heavy oil. There is little evidence of conversion to liquid gas.

799 APTIC NUMBER 11673

Jones, K. H., J. F. Thomas, and D. L. Brink
CONTROL OF MALODORS FROM KRAFT RECOVERY OPERATIONS BY PYROLYSIS. Preprint, Public Health Service, Arlington, Va., National Air Pollution Control Administration, 20p., June 1968. 15 refs.

The pyrolysis and recombination steps of combustion in kraft mill processes were isolated for study because they encompass the reaction mechanisms responsible for producing malodorous compounds. Steady-state pyrolysis of concentrated black liquor was carried out over a temperature range of 480 to 1135 C to describe the process variables that would influence the design of a pyrolysis unit to minimize emissions of malodorous sulfur compounds from recovery operations. Several additional preliminary experiments were conducted using soda pulping liquor as a substrate with various

inorganic sulfur salts added as the sole sulfur source for the purpose of describing production mechanisms for hydrogen sulfide as well as organic sulfur compounds. Results indicate the importance of temperature with respect to the relative production of malodorous sulfur compounds during the pyrolysis and recombination steps of kraft black liquor combustion. The requirement for definitive temperature control makes isolation of pyrolysis into a unit process attractive. The thermal efficiency of such a system coupled with the elimination of two unit processes currently in use further enhances such a design. The steady state data obtained in this study have provided the design parameters for a scale prototype system now under construction. The isolation and quantitation of organic sulfur compounds other than those most commonly reported suggest that they may be responsible for environmental perception when viewed in the relative framework represented by a simple odor model. The need for improved sampling and analysis of draft recovery process streams is indicated. (Author conclusions modified)

800 APTIC NUMBER 12506

Jones, K. H., J. F. Thomas, and D. L. Brink
MALODOROUS PRODUCTS FROM THE COMBUSTION OF KRAFT BLACK LIQUOR, V. STEADY STATE PYROLYSIS. Preprint, 30p., 1968 (7). 12 refs.

The variables associated with the steady state pyrolysis of unoxidized kraft black liquor as well as soda liquor combined with various sulfur salts were determined. The temperature range spanned 480 to 1135 C. Measurements included mass balances of gross pyrolysis products, the qualitative and quantitative analysis of fixed gases, the qualitative and quantitative analysis of sulfur, and the heat content of the gas and solid phases. The results showed that pyrolysis has promise as a unit process for the control of emission levels of malodorous combustion products. The requirement for definitive temperature control in the pyrolysis step of combustion was clearly demonstrated. The thermal efficiency of the pyrolysis process with respect to potential heat recovery was quite acceptable. The fact that the wet gas effluent was self sustaining with respect to flame propagation eliminates the need for direct evaporation which in turn would eliminate the need for black liquor oxidation. Possible design schemes for the application of pyrolysis were presented previously. The steady state data provided design parameters which allow the construction of a scale prototype system. The isolation and quantitation of organic sulfur compounds other than those most commonly reported suggested that there is a definite need for improved sampling and analytical methods for the identification and quantitation of the total array of malodorous compounds being emitted to the environment of kraft mills.

801 APTIC NUMBER 16549

Kageyama, Hisashi
PRESENT STATUS AND FUTURE PROSPECTS OF AUTO EXHAUST CONTROL. (Jidosha haishutsu gasu taisaku no genjo to doko). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(7):405-409, July 15, 1968. 3 refs.

In Japan, some progress in controlling auto engine exhausts has been realized as the result of control measures introduced in 1966. For example, despite increasing traffic, there has been a decrease in the CO detected at intersections due to improvements in the road system and the traffic environment. Improvement of the traffic environment and efforts to find alternative control methods are discussed. Alternatives involve such practical steps as restrictions on traffic, improvement of automobile structure and functions, and city planning. Another approach has not yet been adopted by any other country. Conventional tests on auto exhaust gas are directed toward measuring gas emissions from prototype engines. It is obvious, however, that the problem of exhaust gas becomes more serious as the number of automobiles increases. Therefore, revision of the present auto inspection standard is underway. Owners of automobiles are required to have their cars inspected periodically at six month intervals. With the new inspection standard, 30% decrease in total CO gas emission is expected in comparison with that obtained by the regular test.

802 APTIC NUMBER 11792

Kaiser, Elmer R.
REFUSE REDUCTION PROCESSES. Public Health Service, Cincinnati, Ohio, National Center for Urban and Industrial Health, Proc. Surgeon General's Conf. Solid Waste Management Metropol. Washington, 1967, p. 93-103. 2 refs. (July 19-20).

The following processes are considered with respect to weight and volume reduction of refuse containing organic combustible matter and an important fraction of noncombustibles: open burning at dump sites; burning in conical metal chambers; landfilling; composting, with sale of compost; incineration without heat recovery; and incineration with heat recovery. Volume reduction is impressive when incinerated residue is landfilled. After depositing, the residue from an original ton of refuse occupies no more than 0.194 cu yd. Attention is also called to the demonstrated possibility of oxidizing and melting incinerator residue and to the use of electrostatic precipitators, gas scrubbers, and bag filters to meet new dust emission standards. The advanced state of European incinerator art is reviewed. The new-type refuse reduction plants discussed consists of refuse receiving pits, cranes with grapples to elevate the refuse to hoppers, stoker-fired boilers, precipitators, and chimneys 260-390 ft high. Because of the water-tubed furnaces, the refuse can be burned with 1.6 times the stoichiometric air, instead of three times as in U. S. practice; the weight and volume of flue gas to be cleaned is reduced considerably. The cooling of the gases to 500-600 F in the boiler-superheated-economizer contracts the gas volume without the addition of spray water. The generated steam is used for the production of electric power and for district heating, in conjunction with the local electric utility. Because it is lower in moisture and ash, U. S. refuse should generate more steam per ton than European refuse.

803 APTIC NUMBER 17393

Kawada, Masaaki
ABATEMENT OF AUTO EXHAUST POLLUTION: PRESENT AND FUTURE. (Jidosha haikigasu no jogai to kongo no kadai). Text in Japanese.

Kogai to Taisaku (J. Pollution Control), 3(1):25-26, Jan. 15, 1967.

It is gradually becoming clear which of the auto exhaust components are injurious to human health. Gases which are harmful must be abated successively. It is not the exhaust gas as such but the extent of the atmospheric pollution that has a direct influence on the human body. For the purpose of abatement of auto exhaust, a number of devices must be tried on the automobile engine to lower the quantity of pollutants below the permissible level. There is a serious storage of experienced men in this field. In this respect, Japan is behind other countries as a result of economic conditions. Among various methods of abatement, an afterburner is the most advanced practical method. A device to adjust the ignition interval is used to diminish the harmful ingredients in the exhaust, especially at idling. Japan needs to increase the number of individuals actively engaged in air pollution research and in improving and perfecting control equipment. All parties in various fields should feel free to express their ideas and exchange opinions, so that technology can keep apace of legislation. From the technical point of view, manpower is needed from such diverse fields as chemistry, petroleum, analytical chemictry, mechanical engineering, medicine, road construction, and so forth.

804 APTIC NUMBER 17367

Kawaguchi, Kunitomo
ACCIDENT OF DUST EXPLOSION. (Funjin bakuhatsu saigai). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 7(5):33-39, Jan. 1, 1970. 2 refs.

Several factors related to dust explosion and some principle control methods were presented. Factors in dust explosion include combustible dust in an explosive mixture with air, minute inflammable dust particles staying in the atmosphere long enough to defuse inflammation and less damp dust. The existance of inactivated substances decreases the possibility of explosion. For example, limestone or gypsum powder is sprayed in the surrounding atmosphere of mining areas or placed around a location to slow down the possibility of explosion. The existance of a bare lamp, static electricity, friction, and poorly arranged electrical wires serve as an ignitor. Division of the dust layer without dust explosion can be controlled. To summarize, dust explosion can be restricted by two principle methods: control of the mixture between air and dust, and control of the ignition sources. What appears practical with respect to mixture control is sufficient ventilation to restrict the dust density to below the explosion limit and to arrange instruments or tools in an order so as to avoid even a small explosion resulting from cumulated dust. Work and cigarette smoking should be restrained near bare lamps. Electrical equipment responsible for ignition should be covered with explosion-proof materials. To avoid friction and rubbing associated with a working place, metal tools and rubber soled shoes are not recommended. Static electricity should be released safely into the ground. Regulations concerning dust explosion and several cases of dust explosion were presented.

805 APTIC NUMBER 12380

Knight, B. E. and C. H. T. Wang
SOME EXPERIMENTS ON THE MODE OF ACTION OF A DIESEL SMOKE SUPPRESSANT ADDITIVE. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 13p. 3 refs. (Nov. 25-26, Paper 5.)

A program of testing a diesel fuel additive of barium-containing soap in a hydrocarbon carrier fluid, at a recommended concentration of 0.25-0.5% v/v, was carried out to determine the effects and mechanism of the additive. It was very effective in reducing smoke but had only a marginal effect upon all aspects of engine performance. Photographed flame in the engine appeared to burn out earlier with the additive and at a time when gas temperatures were high. Thus, the additive was not just a catalyst for low-temperature burning of carbon. Quantitative measurements of carbon formation could not be achieved, so it is not possible to state with certainty whether the additive reduces carbon formation. The most likely mechanism of action of the additive is by assisting the burning of carbon at the early stages of the engine expansion stroke. (Author abstract modified)

806 APTIC NUMBER 11817

Koehler, Al, Terry Moore, Michael Garet, Marilyn Wright, Cathy Kazner, and Richard Drews
A STUDY OF THE CONSIDERATIONS INVOLVED IN IMPLEMENTING CP CAR POOLS. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 267-280, 1968. 4 refs.

The use of a computerized car pool as a means of reducing smog formation in the Los Angeles area was explored by investigating employees attitudes toward the proposal, as determined by questionnaires. Factors influencing people to join or to refrain from joining are itemized. Also considered are those factors serving as inducements for companies to sponsor car pools and those influencing them not to set up pools. Of the companies surveyed, the majority of successful pools were in production type companies and composed of hourly blue collar workers or secretaries. Details of a computerized car pool system are still in the process of development. Preparation of computer-coded maps of the area are in progress and additional methods of obtaining feedback about a computerized pool group are being considered.

807 APTIC NUMBER 11608

Kopa, Richard D., James D. Pinkerton, Frederic H. Hollander, Hiroshi Kimura, Melvin L. Feuer, and Gerold D. Daughenbaugh
COMBUSTION PROCESS CONTROL. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-69, p. 105-120, Sept. 1968. 15 refs.

Research is described for studying the combustion process in internal combustion engines and developing methods for the preventive control of pollutant emissions. Previous work is summarized on the use of gasoline-water emulsions for nitrogen oxides control, and the effectiveness of exhaust gas recycling

devices in reducing nitric oxide emissions. Current experiments include the investigation of the possible effects of the condition of the wall deposits in the engine combustion chamber on the concentration of NO in the exhaust gas. It is emphasized that in present and future research on engine combustion, the continuous sampling of the reacting gas mixture by means of a molecular beam and a simultaneous analysis of the sample by a time-of-flight mass spectrometer, has great advantages in the continuous analysis of the products of the fast reactions occurring in the combustion chamber.

808 APTIC NUMBER 12435

Lachapelle, David G., James L. Tarbox, and David L. Goff
EVALUATION PROGRAM FOR RADIOACTIVE WASTE INCINERATION. (SUPPLEMENT). Army Nuclear Defense Lab., Edgewood Arsenal, Md., NDL-TM-24, 24p., Oct. 1965. 5 refs.
CFSTI, DDC: AD 473384

A 50-lb/hr incinerator and associated gas-cleaning equipment for the concentration of low-level radioactive waste was designed and fabricated. The results of contractual performance tests were reported. All items met overall performance test requirements except the air-dilution valve, which was rejected because of leakage in excess of specified limits. To replace the rejected item, a new air-dilution system was designed, fabricated, installed, and tested. Minor deficiencies were noted during the testing, but were corrected. The engineering evaluation program was described. Techniques being evaluated include the use of overfire auxiliary air, continuous auxiliary gas fuel, combustion temperatures up to 2500 F, and dry collection methods for effluent gas-cleaning. The objectives and procedures to be employed during the radiological and isotopic evaluation were briefly outlined. The radiological program will be reported later. (Author abstract modified)

809 APTIC NUMBER 18064

Lawrence, Geoffrey L., J. Buttivant, and C. G. O'Neill
SMALL CARS EMIT LESS CO AND HC WHEN USING DUPLEX CARBURETION TO DISTRIBUTE FUEL MORE EVENLY. S.A.E. (Soc. Automot. Engrs.) J., 77(4):50-53, April 1969.

Duplex carburetion is yielding significant reductions in the hydrocarbon and carbon monoxide emissions in the exhaust from engines used in small cars by providing more nearly uniform cylinder-to-cylinder air-fuel ratios. The system involves the use of an inlet manifold with both primary and secondary conduits and a Stromberg constant-depression (air valve) carburetor. A number of primary and secondary throttle arrangements are discussed. The effects of the use of duplex manifold equipment and temperature compensators on engine exhaust emissions are presented graphically.

810 APTIC NUMBER 12400

Little, J. C.
AIR CLEANING AT THE AEC'S Y-12 PLANT. Union Carbide Corp., Oak Ridge, Tenn., Nuclear Div., AEC Contract W-7405-eng-26, 30p., July 31, 1968. (Presented at the Joint Conference International Atomic Energy Authority and 10th Air Cleaning Conference New York, N. Y., Aug. 26-30, 1968.)
CFSTI: Y-EP-170

Air cleaning is a major consideration at the Atomic Energy Commission's Y-12 plant, where vital nuclear production capabilities are maintained and where research associated with physical and biological sciences is conducted. The variety of the air-cleaning facilities employed are discussed and illustrated in a series of schematic flow diagrams. A typical exhaust air system serves the machine tool on which uranium-235 metal is machined into shape. The tool and work area are enveloped in a transparent enclosure that contains at the source metal particulates and tool coolant which become airborne. Room air is not recirculated. To assure that airborne radioactive particles are captured, all room exhaust, as well as machine exhaust, is filtered through felt bags before release to the atmosphere. Similarly, hood exhaust from beryllium and thorium processing equipment and room exhaust are combined and filtered through high-efficiency filters. Other special facilities at the plant are calutron installations for electromagnetic isotope separation, high-purity research laboratories, and a contaminated waste incinerator. Their ventilation systems are detailed. Also discussed are pre-filter failures which can affect the service life of high-efficiency filters and design details of adequate filter framing systems.

811 APTIC NUMBER 18063

Love, L. R. and S. F. Whirl
DUQUESNE LIGHT BURIES ITS FLY-ASH PROBLEM. Coal Age, 74(3):90-94, March 1969.

The troublesome air pollution problem of handling fly ash and the equally troublesome water pollution problem of disposing of acid mine water are being solved simultaneously by sluicing alkaline fly ash into an abandoned section of a deep mine and pumping neutral or slightly alkaline water to the river. The disposal system has operated continuously for 18 mo. at Duquesne Light Co.'s Colfax power station and Harvick mine. The system is described in detail, discharge water quality is discussed, and a limited appraisal of the economics of the system is made.

812 APTIC NUMBER 12434

Mann, W. L.
A STUDY OF METHODS OF GREASE REMOVAL FROM COMMERCIAL KITCHEN EXHAUST AIR. American Gas Association, Inc., New York. Proj. 1A-12. RR-1323, 26p., Dec. 1960. 10 refs.

Methods of removing grease and odor from kitchen exhaust gases were investigated. Various basic designs were developed and evaluated for a grease vapor incinerator. Consideration was given to such factors as gas consumption, grease removal efficiency, size and application, and materials of construction. Experiments were conducted to evaluate the performance of commercially available filters and ventilators and the experimental

designs of grease vapor incinerators built to determine the advantages and disadvantages of these methods of removing grease from exhaust air. The filters used were standard low velocity and low cost velocity models, 20 inches by 2 inches in size. There were five experimental models of grease vapor incinerators. These consisted of two basic designs: centrifugal separation of particles, and particle impingement on hot surfaces. Although conventional grease filters remove some grease from the kitchen exhaust air, they are limited. They do not remove all the grease from the air and must be frequently cleaned. It is possible to remove grease vapor and particles by impinging the vapor and particles on surfaces hot enough to incinerate the grease. The grease can be removed more completely by incineration than by the use of commercially available filters, which was evidenced by the comparative efficiencies. Because it is necessary to heat the baffles in the incinerator to temperatures high enough to burn the grease vapor, the grease vapor incinerator should be installed so that only the grease laden air passes through it. Any excess air will have a cooling effect on the baffles, reducing the efficiency, or they will require more heat to maintain the same efficiency. (Author summary modified)

813 APTIC NUMBER 18049

McReynolds, L. A.
HERE'S WHAT PHILLIPS IS DOING TO AID AIR CONSERVATION AT ITS PLANTS. Oil Gas J., 67(12):106-107, March 24, 1969.

Phillips Petroleum Company's long-range air pollution control plans call for updating facilities at all manufacturing plants and for including modern, effective control facilities in the design of each new plant. As examples of air conservation measures recently undertaken those at the new Puerto Rico chemical complex, at an Ohio carbon-black plant, and at the Avon refinery, near Martinez, California, are discussed.

814 APTIC NUMBER 18037

Moody, Dennis M.
BLOWPIT GAS RECOVERY WITH A SINGLE BLOW STACK SYSTEM. Tappi, 52(3):448-450, March 1969.

A single blow stack system for the recovery of blowpit vent gases has been designed and installed, replacing multiple wooden blow stacks. It consists of a stainless steel stack connected to the six blowpits by a header system. The stack acts as a scrubbing column, condensing steam and recovering sulfur dioxide from blowpit gases for reuse. The system is designed to operate at high flow rates and low pressure drops. Water is sprayed counter-currently to rising gases over specially designed stainless steel and wood packing. Water flow control is based on gas temperature and pressure. The system is 98% efficient in SO2 recovery and has resulted in both improved SO2 and heat recovery. Exit gases average about 1400 ppm SO2. (Author's Abstract)

815 APTIC NUMBER 16557

Murase, Akira
THE SITUATION AND CONTROL OF AUTOMOTIVE EXHAUST EMISSIONS IN THE MIDDLE CITY (I). IN KAWASAKI CITY. (Chutoshi ni okeru jidosha haikigasu no genjo to taisaku (I) Kawasaki shi ni okeru ichirei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(7): 430-436, July 15, 1968.

Kawasaki city is located in the middle of the Tokyo-Yokohama industrial and business area. Its population is over 920,000 and the number of automobiles registered in the city was 45,668 as of March, 1967. Because air pollution in the city was considered primarily the result of industrial contamination more effort was expended to control industrial pollution than automotive pollution. However, a survey of the auto exhaust gas emissions, conducted at main intersections since 1967, showed that pollution from engine exhausts was as serious as that from industrial sources. Since no reliable study was available in this field, a specific traffic survey aimed at the reduction of the automotive exhaust gas was undertaken. The survey included the installation of exhaust gas testers and carbon monoxide cleaners in test cars. Twenty test cars of 1900 cc cylinder were used. Carbon monoxide concentration before the installation of a CO cleaner was 0.9% minimum, 8.0% maximum, and 4.5% average. After the installation of a CO cleaner, the figures changed to 0.1%, 3.0%, and 0.7%, respectively. The number of tests was too limited to give a decisive conclusion, but the results appear promising.

816 APTIC NUMBER 17414

Nakajima, Keitaro and Yoshio Yamakawa
RECENT DEVELOPMENT OF CONTROL TECHNIQUES OF AUTOMOTIVE EMISSIONS. (Saikin no jidosha haishutsu gasu seigyogijutsu). Text in Japanese. Jidosha Gijutsu (Autcmobile Eng.), 23(11):1164-1173, 1969. 19 refs.

Progress in automotive exhaust control from 1966 through 1969 is reviewed. The main innovations in American and European automobiles are presented, followed by an explanation of the throttle positioner system developed by Toyota. In this method, the throttle valve is kept open by a certain amount during deceleration. The hydrocarbon exhaust at deceleration is greatly reduced without affecting the efficiency of engine brake. The 1970 U. S. federal regulation on auto exhuast is 30% more severe than that of 1968. New devices for meeting the current standards are reviewed. Techniques for controlling evaporation from gasoline tank and carburetor float chambers are explained in detail, since the method of sealed housing for evaporative determination is employed. A control technique for nitric oxide designed primarily to pass the California regulation in 1974 is also discussed. Devices for processing exhaust from the exhaust port are surveyed, including a reactor, afterburner, and catalytic converter. An attempt to employ extremely low fuel-to-air ratio to reduce carbon monoxide and hydrocarbons by a layered combustion is also explained. It is concluded that further research is needed in the exhaust control field.

817 APTIC NUMBER 12228

Naval Supply Research and Development Facility, Bayonne, N. J.

INTERIM REPORT ON THE INSTALLATION OF CARBON MONOXIDE ELIMINATOR MUFFLERS. Proj. MT003020(b), Engr. Rept. 5.2120, 32p., Feb. 21, 1952. 4 refs.
CPSTI,DDC: AD 648334

Catalyst mufflers for carbon monoxide elimination were installed in 18 4000- and 6000-capacity fork trucks and subjected to life-service tests. Performance of the mufflers was unsatisfactory. Mechanical failures occurred due to the method of supporting the muffler and of connecting it to the engine. Alarm units, designed to provide a means of turning off the engine automatically if the catalyst failed to come up to temperature, were unable to withstand the shock and vibration imposed on them. A rattle in the muffler was discernible upon acceleration, and operators complained about odors which they do not encounter in regular gasoline powered engines. Moreover, the mufflers radiated sufficient heat to cause blistering of paint on the side walls of the trucks. When heat shields were installed on the side walls, the method of support caused water leaks around engine stud bolts. Nevertheless, it is concluded that the muffler offers enough promise for development and design research to be continued.

818 APTIC NUMBER 12288

Havratil, James D.
DISPOSAL OF FLUORINE. Dow Chemical Co., Golden, Colo., Rocky Flats Div., AEC. Contract AT(29-1)-1106, Aug. 29, 1968. 44 refs.

A literature review of fluorine disposal systems utilizing liquids, solids, and gases is given. The literature makes frequent mention of caustic solutions and water. Sodium hydroxide solution is the most desirable liquid agent, especially when CaO is added to regenerate NaOH. A review of media used for solid disposal includes charcoal, alumina, soda lime, and several other less efficent agents. Static beds of coconut charcoal and fluid beds of activated alumina were reported to be highly effective fluorine disposal systems. No explosions were encounterd with the use of charcoal. Apart from the literature review, experiments were static-bed disposal traps to evaluate activated alumina, soda lime, and charcoal as fluorine disposal agents are described. Exhaust line plugging occurred when alumina was used as the disposal medium. Plugging problems were less severe with soda lime. Water evolved during the fluorine-soda lime reaction, but it presented no problem. The use of wood charcoal eliminated plugging problems, but pressure surges were noted during the reaction. A check valve upstream from the disposal trap prevented interference on the upstream system from the trap. Charcoal was selected as the most desirable disposal medium because of its high disposal capacity, gaseous reaction product (CF_4), and freedom from trap plugging.

819 APTIC NUMBER 12234

North American Rockwell Corp., Canoga Park, Calif., Atomics International Div.
DEVELOPMENT OF A MOLTEN CARBONATE PROCESS FOR REMOVAL OF SULFUR DIOXIDE FROM POWER PLANT STACK GASES. (SUMMARY REPORT). Contract PH 86-67-128, AI-68-104, 155p., 1968. 8 refs.
CFSTI: PB 179908

A Progress report is presented of a method being developed for sulfur dioxide removal from power plant stack gases. The sulfur oxides are absorbed in a molten mixture of lithium, sodium, and potassium carbonates, reacting with the carbonates to form sulfites and sulfates, which remain dissolved in excess carbonate. The molten carbonate-sulfite-sulfate salt mixture is then regenerated chemically, converting the sulfite and sulfate back to carbonate and the sulfur to hydrogen sulfide. The carbonate is then recirculated to the scrubber to continue the process. Testing shows the carbonate melt to be an excellent absorbent under realistic conditions, with a very fast reaction rate. The main problem in the absorption process is one of bringing the sulfur oxides into good contact with the melt. Recent reduction studies are emphasizing catalysis to increase the rate of the reduction reaction. Regeneration refinement is underway to eliminate sulfur tie-up and foaming problems from reduction catalysts. Corrosion studies of suitable metals and alloys, and contactor development, are described.

820 APTIC NUMBER 12381

Oliver, W. T.
PRACTICAL EMISSION CONTROL SYSTEMS--AIR INJECTION INTO EXHAUST MANIFOLD. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 6p. (Nov. 25-26, Paper 6.)

The physical, operational, and economic aspects of reducing exhaust emissions by air injection into the exhaust ports were investigated. The system was developed on the standard and G. T. versions of the 1600 cu cm engine and was able to meet the target emissions levels of 410 ppm hydrocarbons and 2.3% carbon monoxide, with a power loss of 5% on either version. To divert excess secondary air from the exhaust during deceleration, air was discharged to the atmosphere during the initial stage of deceleration. The minimum air requirements were determined for the two systems and it was possible to achieve these from one type of pump driven at different speeds. Production tolerances had to be reduced for good emission control, but it was still possible to specify realistic economic limits. Flow tolerance on all units was reduced by about 30% and it was not found necessary to select special carburetors. Rich idle settings were found beneficial and idle speeds of 700-740 rev/min were determined, with an idle ignition timing of 4 deg b.t.d.c. on all models. These settings gave the best compromise between emission control and driveability. No vehicle component was adversely affected in 50,000-mi durability tests; the deterioration factors over this mileage were established as hydrocarbons, 1.062; CO, 0.938. The cost of the system is appreciably higher than that of other control systems, but in addition to a shorter development time air injection, offers such technical advantages as insensitivity to fuel formulations and atmospheric conditions.

821 APTIC NUMBER 17331

Otte, Guenter
NEW PROCEDURE FOR THE SOLUTION OF DUST EXTRACTION PROBLEMS. (Neues Verfahren zur Loesung von Entstaubungsproblesen). Text in German. Wasser Luft Betrieb, 13(12):464-466, 1969.

'Kontrelon' (contraction of Konzentrations-Trenn-Zyklon) is a simple device resembling a cyclone separator, but differing from it by having two air outlet openings and an uncommonly long dip tube. Results of 11 tests made on the earliest design of this device using dust-bearing air from a sand-blasting shop with dip tubes of different lengths, diameters, and dipping depths at volume rates of flow of the incoming air between 4700 and 5730 cu m/hr and with different air-flow partition ratios, are given. The measured variation of the static pressure and the magnitude, the axial and the radial components of the air velocity with the distance from the central axis at different levels within the 800-mm diameter cylindrical body of the device is shown. It is possible to separate from a dust-bearing waste-gas stream a clean partial gas stream ahead of a needed high-performance dust-removal installation. The measurements of the detailed flow pattern in the tested device have made possible a complete understanding of the process of dust separation and, hence, the specification of the optimal dimensions of the device. The applicability of this method of dust separation depends on the share of small grain sizes in the dust. It offers the opportunity to effect savings of the invested capital with new installations as well as to improve the performance of already existing dust-removal installations. Moreover, in cases when the waste-gas output is subject to large variations, it is possible to reduce the peak loads on the dust-removal installation which frequently are responsible for a considerable increase of the dust-removal costs for relatively short operating durations.

822 APTIC NUMBER 12411

Parniampour, Hassan
STUDY OF THE PENETRATION OF AEROSOLS INTO FILTER BEDS. (Etude de la penetration des aerosols dans les couches filtrantes). Paris Univ. (France), Faculte des Sciences, Thesis (Ph.D), Gif-sur-Yvette (France), Commissariat a l'Energie Atomique, Service de Documentation, (Also, Commissariat a l'Energie Atomique Rept. 3347.) 1967, 58p., 14 refs. Translated from French. Argonne National Lab., Ill., Chemical Translation Service, 52p., Aug. 1968.
CFSTI: ANL TRANS 655

A radioactive aerosol is used to study the penetration of particles to the interior of different filtering media. The detection of an active thoron deposit, either fixed or not on atmospheric particles and caught by a filter, was performed by alpha scintillation. Tests showed that the pentration of an ultrafine aerosol into a fibrous filter involves two successive processes; a surface effect and either laminar or turbulent diffusion, depending on velocities. Pentration in porous membranes seems fundamentally similar to that in fibrous filters. Changes in penetration, as a function of either porosity or rate of filtration, yield only a qualitative check of the theory; in all cases, the penetration is much greater than predicted. The different applications of the method are discussed, with emphasis on the determination of the absorption coefficient for alpha particles and changes in the absorption factor with filtering speed.

823 APTIC NUMBER 12127

Pedigo, W. R., C. R. King, L. A. Dean, J. E. Owens, and S. Bernstein
FLUIDIZED BED RECOVERY OF FLUORINE IN THE MANUFACTURE OF UF6. Preprint, American Institute of Chemical Engineers, New York, N. Y., 22p., 1964. 3 refs. (Presented at the Symposium on Nuclear Plant Experience with Fluidized Beds, Part I, American Institute of Chemical Engineers, 53rd National Meeting, Pittsburgh, Pa., May 17-20, 1964.)

Recovery of dilute fluorine at the Atomic Energy Commission's Gaseous Diffusion Plant at Paducah, Kentucky, is based on a fluidized bed process. The all Monel reactor is 27-in. in diameter and employes a bed of UF4 at a depth of 4.5 ft. Operation of the reactor depends on the reaction of fluorine with UF4 to produce gaseous UF6 and several solid compounds with fluoride-to-uranium ratios between UF4 and UF6. The reactor operates at approximately 750 F. The process gas steam for the reactor is the primary UF6 process vent gas stream containing 20-40% fluorine. Initial development of the fluidized bed recovery process was conducted in an existing plant reactor. Because of the similarity of operation, the facilities of the fluidized bed UF6 absorber were temporarily modified for a pilot-plant investigation. A total of eight runs were made during the investigation with fluorine concentrations of 5-30% and at 600 to 900 F. Based on the results of this study, a prototype reactor was built and operated for one year. With the current unit, fluorine recovery efficiencies are greater than 95% while reactor-on-stream efficiencies average about 99%. Equipment maintenance is negligible.

824 APTIC NUMBER 18035

MONITORING AIR POLLUTION. Penn. Health, 30(1):18-20, Spring 1969.

The Pennsylvania Health Department's air pollution control engineering staff has been active in the enforcement of Regulation IV which controls so-called "local" air pollution problems (those caused by a single source or group of sources in close proximity to each other. Dustfall jars, high volume samplers, lead candles, tape samplers, stack tests, and automatic monitors have been used for extensive field tests. With acceptance of the concept of regional air basins, a new regulation, Regulation V, is being developed. This will result in the establishment of a program to control "area" or "air basin" pollution throughout the Commonwealth. Based upon existing air quality, topographical, meteorological, population and industrial density characteristics, ten air basins have been tentatively established. Modern air sampling equipment will be used for a sampling network throughout the Commonwealth.

825 APTIC NUMBER 12347

Plass, Robert J. and Harold H. Haaland
ELECTROSTATIC PRECIPITATORS IN THE CEMENT INDUSTRY. Preprint, Pennsylvania State Univ., University Park, 29p., 1957. (Presented at the Electrostatic Precipitation Seminar, University Park, Pa., June 16-21, 1957.)

The applications and problems of electrostatic precipitators in

cement plants are reviewed. Precipitators have a variety of uses in these plants, including collection of dust from coal handling systems, emissions from rock and shale drying, and cleaning effluent air from modern air-swept raw and finish grinding mills. By far the greatest problem, however, is the cleaning of dust from kiln gases. The specifics of the problem vary, depending on the kind of plant and kiln and the raw material source. Although the quantity of dust to be removed is a management decision which must depend on individual plant and community factors, as a general frame of reference there has been wide acceptance for a relatively clean stack at about 0.05-0.06 gr/CF for low alkali content effluents, and at about 0.025-0.03 gr/CF for higher alkali content effluents. Raw feed problems, exemplified by alkali volatilization, are discussed, as well as sulfur oxides from the presence of sulfur kiln feed and in fuel. Difficulties related to the major cement-making systems in current use, including wet process, filter cake feed, dry process, wet nodulizing kiln, and Fuller-Humboldt preheat, are examined in some detail, and progress in precipitator design as it applies to the cement industry is described.

826 APTIC NUMBER 15630

Pociecha, Z.
FACTORS INFLUENCING THE WATER CONSUMPTION AND OPERATIVE PARAMETERS IN WET CLEANING OF BLAST FURNACE GAS. (Wpływ niektorych czynnikow na zuzycie wody i jej wskazniki przy mokrym odpylaniu gazu wielkopiecowego). Text in Czech. Prace Inst. Hutniczych, 20(6):387-393, 1968. 3 refs.

The problem of water consumption in wet cleaning of blast furnace gas is essential, both from technical and economic points of view, as the cost of water constitutes about 35% of total costs of this operation. The influence of various factors on water consumption and the operative parameters for water consumption in wet cleaners of the blast furnace gas were determined. Trials were carried out in the steelworks producing the ferromanganese as well as the open hearth pig iron. The effect of temperature and pressure on the raw gas and the dust content in this gas, the relationship of the wash water pressure to the amount of the consumed water, and the efficiency of wet cleaning elements were examined. During the investigations, the rate of water consumption by wet cleaners and their elements was determined. The trials revealed that the water rates in spray towers depend on the pressure of water. The influence of other parameters, such as the temperature and pressure of gas, was not great. The final cleanliness of the blast furnace gas depends on the initial dust content. The rate of water consumption, calculated with reference to 1000 N cu m, varies within broad limits. It is very much affected by the condition of disintegrators. Disintegrators, dirty from the deposited dust, affect not only their own water consumption, but also that of washers and of the whole gas cleaning system. The clogging of disintegrators by the blast furnace dust is especially rapid and serious when the ferromanganese is produced, in which case the effective service time of disintegrators becomes approximately half as long as when the cleaned gas comes from the open-hearth pig iron production. The formation of these deposits may be attributed, among other factors, to the physico-chemical properties of washer effluents in wet cleaners of the blast furnace gas. (Author summary modified)

827 APTIC NUMBER 11800

Potter, Allen E.
SULFUR OXIDE CAPACITY OF LIMESTONES. Preprint, National Air Pollution Control Administration, Washington, D. C., Div. of Process Control Engineering, 14p., 1969. 9 refs.

The low cost and widespread availability of limestones has led to interest in their use as reactants for desulfurization of combustion gases. Eighty-six carbonate rock samples were tested in a fixed-bed reactor to determine their capacity to react with flue gas containing sulfur dioxide. Although most of the work was performed with the carbonate and the oxide at standard test conditions, supplementary tests were made on hydrates, oxides, and carbonates over a wide range of reaction temperatures and calcination conditions. At 980 C, the average sulfur loading of the carbonate feed was practically equivalent to the loading for the precalcined samples. Differences among the samples were only slightly related to chemical composition; porosity, as measured by mercury pore volume, probably caused variations in the capacities of the samples. Chalks and oolitic samples were the most efficient absorbents, and magnesite and Iceland spar the least efficient of the stones tested. Three figures and three tables show experimental data.

828 APTIC NUMBER 18034

Ramirez, Raul
CATALYTIC ROUTE IS READY FOR FLUE-GAS CLEANUP JOBS. Chem. Eng., 76(9):86-88, April 21, 1969.

The Cat-Ox process, which desulfurizes by the catalytical oxidation of SO2 to SO3 and the subsequent formation of H2SO4, is said to remove all of the fly ash and 90% of the SO2 contained in flue gas while recovering high strength sulfuric acid for sale. Tests conducted in a prototype unit have proved the feasibility of the process and have solved problems such as fly ash buildup in key pieces of equipment. A process flow sheet and some economic data are included.

829 APTIC NUMBER 16867

Safford, Donald
CLEAN BURNING OF RESIDUAL FUEL OILS. ASHRAE (Am. Soc. Heating, Refrig. Aircond. Engrs.) J., 11(4):41-43, April 1969. 2 refs.

Good combustion of fuel oil depends on the use of proper equipment selected on the basis of performance criteria. Operation should be possible at 15% CO2, No. 1 ! Bacharach smoke, and 86% combustion efficiency. Exceptionally clean burning can occur with air at less than 5%. At these close to stoichiometric conditions, sulfur trioxide and nitrous oxides were reduced, resulting in less air pollution and extending equipment life.

830 APTIC NUMBER 16861

Semrou, W. P.
MEDIUM-ENERGY SCRUBBER CONTROLS CUPOLA EMISSIONS. Foundry, 97(11):164-165, Nov. 1969.

A custom designed cupola melting-induction furnace installation delivers hot metal economically while solving the problems of air and water pollution. The cupolas have been designed to reduce the cost of the scrubber as well as to meet the metallurgical requirements economically. Offset upper stacks for improved charge-door ventilation, advanced wet cap quenching at the top of the stack, and a variable-annulus component that develops an efficient wetting action are components of the highly successful system. Test results showed that the scrubber achieved an extraordinary degree of cleanup of effluent gases resulting in grain loadings ranging from .014 to .027 gr/scf.

831 APTIC NUMBER 12481

Shiba, Tadao
HYDRODESULFURIZATION OF PETROLEUM RESIDUE. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):43-44, 1967. Translated from Japanese. 9p.

The need for an economical process of desulfurizing petroleum residue is considered, and factors which make hydrodesulfurization of petroleum residue more difficult that hydrodesulfurization of distilled oil are reviewed. Although gas phase hydrodesulfurization can be carried out with distilled oil, it is difficult with petroleum residue, where extremely large amounts of components other than hydrocarbons are present as compared with distilled oil. Many of the components are sulfur compounds that are thermally stable and less reactive to hydrodesulfurization. Asphaltene, which causes inactivation of a catalyst, is also found in large quantities in petroleum residue. Unless a suitable catalyst and suitable reaction conditions are selected, deasphalting of the residue may be necessary. Suggested catalysts for the hydrodesulfurization of both distilled oil and petroleum residue are sulfides of cobalt or nickel and molybdenum on an activated alumina carrier. For hydrodesulfurization of petroleum residue, the highest temperature should be 450 C and the reaction pressure should be less than 200 kg/sq cm. Because of side reactions, the hydrodesulfurization rate should not exceed 80%.

832 APTIC NUMBER 12482

Shigeta, Yoshihiro
THE PROBLEM OF ODOR NUISANCE. 6. THE BAD-ODOR NUISANCE AND ITS CONTROL. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1): 30-33, 1967. Translated from Japanese. 13p.

Offensive odors from industrial processes are a particular problem in Japan because industries are located close to residential areas and because most factories are too small to afford deodorizing facilities. Moreover, there has been no strict enforcement policy. Common sources of odors are chemical plants which process fish solubles into wheat or rice bran. Measures for controlling odors from these processes are discussed. One method is to adopt modern, closed equipment. Another is the installation of dedorizing apparatus. Deodorizing methods currently used by chemical plants and feed factories include combustion, adsorption, ion oxidation, ozone oxidation, rinsing, neutralization, and electric dust collection.

833 APTIC NUMBER 17392

Shirasawa, Tadao
FUELS, COMBUSTION AND SMOKE ABATEMENT. (Nenryo, nensho to haien boshi). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan, Tokyo), 43(451):748-759, Nov. 20, 1964. 20 refs.

Smoke produced by the combustion of fuels is one of the most common causes of air pollution. The use of smokeless, ashless, and sulfurless fuels is most desirable. A smokeless coal developed by the National Coal Board of England is described. The process employes as a raw material a coal powder which is distilled for one hour between 375 and 450 C in a fluidized bed. The resulting powder is formed into the final product by either a Bronowski or Sharp process. A test apparatus to study the smoking tendency of coals is explained. Countermeasures for dust and sulfur are also described. Since the primary objective of combustion is efficient heating, fuel firing methods are examined. The nature of the fuel and the conditions of its mixing with oxygen are among the most important factors determining soot emission. The study of soot is very important because radiation from a luminous flame is emitted by incandescent carbon particles which exist in the flame under certain conditions of combustion. A wide variety of soot exists with respect to particle size and chemical composition. Basic studies on the effects of pressure, temperature, type of hydrocarbon, and additives on the formation of soot from the flame are reviewed. Chemical processes leading to the formation of carbon in flames have not been fully understood. It is concluded that smoke abatement can be achieved by the application of those techniques of heat management which have been developed for the purpose of heat economy.

834 APTIC NUMBER 12121

Silverman, Leslie and Charles E. Billings
FUME AGGLOMERATION AND FILTRATION AT HIGH TEMPERATURES. Preprint, American Society of Mechanical Engineers, New York, 13p., 1959. 18 refs. (Presented at the American Society of Mechanical Engineers Semi-Annual Meeting, St. Louis, Mo., June 14-18, 1959, Paper 59-SA-39.)

Because of the fine size of particulates created in an open-hearth furnace, agglomeration is continually taking place. To promote additional agglomeration of fume in flowing gases at high temperature, a rotary-screw agglomerator was developed and tested on laboratory and field iron-oxide fumes. It consists of a standard conveyor screw mounted in a cylindrical sheet-steel casing, with tangential entry and exit and provisions for rotating the screw. This provides an extended gas path for operating diffusional coagulation, an extended surface for thermal and contact agglomeration, and a circular path for the action of centrifugal forces, as well as a means of collecting agglomerates. The agglomerator is utilized with slag-wool filter produced by a wet-slurry process. Gas velocity is maintained at 100-150 fps

with these filters which reduces space requirements. If mechanical leakage is eliminated, the filters give efficiencies of 95-99% on open-hearth fumes. Various methods of in situ cleaning of the filters were tested. The most promising appears to be blast waves from exploding diaphragms. The agglomerating filtration and the cleaning methods reviewed can be applied to effluents from gas turbines, air or gas-cooled nuclear reactors, incinerators, boiler flue gases, and many metallurgical processes.

835 APTIC NUMBER 12424

Skaperdas, George T.
COMMERCIAL POTENTIAL FOR THE KELLOGG COAL GASIFICATION PROCESS. (FINAL REPORT). Kellogg (M. W.) Co., Piscataway, N. J., OCR Contract 14-01-0001-380, Research and Development Rept. 38, 151p., Sept. 1967. 7 refs.
CFSTI: PB 180358

The Kellogg coal gasification process represents a unique new method for attacking the problem of coal gasification. Steam and coal are injected continuously into a molten salt bath where they react to form synthesis gas, a mixture of hydrogen and carbon monoxide. The necessary heat of the reaction is supplied by circulating a heated molten salt stream. In addition, the molten salt mixture is chosen to catalyze the reaction so that it can be carried out at a relatively low temperature. In this report, the research that has been done on the process to date is summarized. Included are the chemical engineering studies on which the process is based, optimization studies and cost analyses of the various schemes under consideration, and work done in the areas of chemical research and mechanical development for those portions of the process deemed most critical. The general objectives of a proposed pilot-plant program are outlined. Since oxygen does not have to be added to the gasifier, the process permits important cost savings over presently available processes for gasification of coal under pressure. Further savings result from the lower reaction temperature, which minimizes the sensible heat duty demands of the process. Moreover, as the coal is suspended in a salt melt, the physical properties of coal particles are not critical to the process. An additional advantage is that molten salt retains the sulfur originally present in the coal. The process thus eliminates the pollution problem associated with sulfur dioxide in stack gases. The sulfur retained by the coal can be readily coverted to elemental sulfur by the Claus process.

836 APTIC NUMBER 11952

Soejima, Umio and Koichi Yoshida
COUNTERMEASURES TO AUTOMOBILE EXHAUST GAS. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 1(1):13-17, 1966. Translated from Japanese. 24p.

Measures to stem automobile exhaust gas emissions enacted in Japan, the U. S., and in Europe are discussed. Japan had about 8 million automobiles at the end of May 1966. Since 1965, the Ministry of Transportation has enforced measures to stem emissions by automobiles. All new models of cars must undergo a standarized test to determine whether the maximum allowable emission concentrations are exceeded. The following driving conditions are simulated on a dynamometer: idling; cruising at speeds from 10 km/hr to 70 km/hr in intervals of 10 km/hr; acceleration from 0 speed wherein the rate of acceleration is 0.1 g and the final speed is reached in five steps beginning at 30 km/hr; and deceleration by engine braking, wherein the rate is 0.06 g. The measures taken to stem exhaust gas emissions consist of engine modifications such as improvement of the air-fuel ratio, the air intake, the ignition time, the combustion chamber, and the valve timing; remodelling the muffler into a direct flame afterburner or a catalytic converter; and addition of chemicals to the fuel. A method is under consideration by which oxygen is mixed with the gasoline so that incombustible matter is oxidized in the combustion chamber. Presently studies are under way primarily in the U. S. to inject air into the exhausts. Studies in Europe concentrate on the elimination of carbon monoxide emissions and on diesel smoke. Japan also focuses its attention on elimination or at least reduction of the carbon monoxide fraction in automobile exhaust.

837 APTIC NUMBER 18038

Spurny, Kvetoslav R., James P. Lodge, Jr., Evelyn R. Frank, and David C. Sheesley
AEROSOL FILTRATION BY MEANS OF NUCLEPORE FILTERS. AEROSOL SAMPLING AND MEASUREMENT. Environ. Sci. Technol., 3(5):464-468, May 1969. 9 refs.

The structure of Nuclepore filters differs greatly from that of all other filter materials, and the filtration properties differ correspondingly. The filter has been evaluated in a variety of applications; its properties suggest new uses. In some applications the Nuclepore is superior, in others inferior, to other filters; on the whole, the new material is complementary to membrane filters. It is especially suitable for collecting samples for light and electron microscopy, short-term gravimetric sampling, and a new approach to particle size determination. It has advantages for use in tape samplers of the AISI type. It is inferior to membrane filters in total retentivity. (Author's Abstract)

838 APTIC NUMBER 18045

Stelle, William W.
TALLEST SMOKE STACK FOR MITCHELL PLANT. Civil Eng. (N.Y.), 39(3): 44-47, March 1969.

A 1600 Mw power plant in West Virginia features a stack 1200 ft. high, perhaps the world's tallest. Dictating the height were such considerations as ridges up to 650 ft. high, and acceptable levels of SO2 concentration at ground level downwind. The stack has a concrete shell (slipformed) and steel lining. Some details of the design features and the bases for design are given.

839 APTIC NUMBER 16862

Stites, J. G., Jr., W. B. Horlacher, Jr., J. L. Bechofer, Jr., and J. S. Bartman

REMOVING SO2 FROM FLUE GAS. Chem. Eng. Progr., 65(10):74-79, Oct. 1969.

Several years ago the catalytic oxidation system for SO2 removal from flue gases was demonstrated to be technically feasible in a small pilot plant which processed 400 scf/min of flue gas. A prototype plant designed to treat 24,000 scf/min has been built and operated to provide the process information required for commercialization. In the first step of the process hot flue gas is taken directly from the boiler at 950 F, and passed through a highly efficient, high temperature electrostatic precipitator designed to remove in excess of 99.5% of the particulates from the gas stream. The gas is then passed through a converter where the sulfur dioxide is catalytically oxidized to sulfur trioxide. The gas is cooled to 650 F in a tubular heat exchanger (boiler economizer) to recover heat, then further cooled in a Ljungstrom regenerative air preheater to about 450 F (above the dew point of sulfuric acid). The gas then passes through an absorption tower that used sulfuric acid as coolant to further reduce the temperature to about 225 F and condense the acid. A Brink Mist Eliminator removes the sulfuric acid mist from the gas which is ejected via the induced draft fan to the stack. The prototype plant has a demonstrated capability of removing all of the fly ash, 90% of the sulfur dioxide, and over 99.5% of the sulfuric acid produced. Although varying with stack temperature, an acid concentration of 80% is considered average.

840 APTIC NUMBER 16870

Stites, Joseph G. and John L. C. Bachofer, Jr.
SUCCESSFUL REMOVAL OF SULFUR DIOXIDE FROM FLUE GAS. Mining Congr. J., 55(6):56-59, June 1969.

Catalytic oxidation is a process for changing sulfur dioxide into sulfur trioxide using a catalyst to force the reaction. Here it is applied to the removal of SO2 from flue gas in a prototype study using commercially available equipment. A 20,000-scfm plant at Portland, Pa. was selected for this installation because it burns a variety of bituminous coals and is essentially a base load station. Flue gas at about 950 F is passed through a highly efficient, mechanical and electrostatic dust collector, then through a converter in which the oxidation to SO3 takes place, then through heat recovery equipment consisting of an economizer, a rotary, regenerative air preheater, and an absorption tower. As the temperature is lowered the SO3 plus water vapor in the flue gas combine to form H2SO4 mist in droplets. These are removed in the absorption tower and in the mist eliminator. Approximately 90% of the SO2 present in the flue gas is oxidized and removed, while more than 99.5% of the acid mist formed is recovered. The strength of the acid is a function of the operating temperature of the absorption tower but averages 80% which is a commercial grade.

841 APTIC NUMBER 18050

Stresen-Reuter, James
CATALYTIC INCINERATOR CONTROLS HYDROCARBONS AND ODORS. Plant Eng. 23(8):142, April 17, 1969.

In the production of varnishes, vehicles and compounds for the paint industry and resins for the foundry industry, batch processing in heated, cooled, and agitated reactors, mixing tanks, and filtering equipment is used. Catalytic incineration has proven to be the most effective method for eliminating any odors from this type of process. A schematic drawing shows the control of fumes from the reactor through a spray tower to the catalytic incinerator.

842 APTIC NUMBER 12383

Sutton, D. L.
ENGINE TUNING TO MINIMIZE EXHAUST EMISSIONS. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 14p. 3 refs. (Nov. 25-26, Paper 8.)

The development of emission-reducing tuning systems for several engines, including twin carburetor and single carburetor automatic systems, is described. With lean set carburation and retarded ignition, tests showed that emission levels could be reached which were within striking distance of the proposed limits. Analysis of the various modes of operation showed that deceleration peaks, and in the case of manual transmissions, gear change peaks, were highly contributing factors. A simple type poppet valve incorporated in the throttle plate of the carburetor, and set to operate at a given manifold depression, considerably reduced emissions during deceleration and gear change, bringing composite values within the prescribed limits. The development of systems involved investigation into carburetor metering, mixture preparation, ignition timing, temperature compensation, throttle damping, and fuel cut-off. Further development of temperature compensating devices for mixture control is a pressing requirement for future work. (Author abstract modified)

843 APTIC NUMBER 17410

Swain, C. Donald, Jr.
GAS SWEETENING PROCESSES OF THE 1960S. Hydrocarbon Process., 49(3):127-130, March 1970. 16 refs. (Presented at the Natural Gas Processors Association Meeting, New Orleans, La., Jan. 15, 1970.)

The discovery of natural gas wells containing very high percentages of hydrogen sulfide or carbon dioxide or both has resulted in the development and application of a number of physical solvent processes. The advantages and disadvantages of the following processes are discussed: Fluor, Sulfinol, Selexol, Purisol, Rectisol, and Estasolvan. All use some organic solvent which depends on selective physical absorption of acid gas rather than a chemical reaction. They have the common characteristic that acid gas loading of the solvent is directly proportional to pressure; the processes are not suitable for low pressure applications. The high acid gas loading attainable greatly reduces the solution circulation rate and is mainly responsible for the reduction in equipment size and cost and in operating utility costs. The solvents generally will remove carbonyl sulfide, carbon disulfide, and mercaptans without degrading the solvent. This characteristic,

plus low vapor pressure, keeps solvent losses low. Corrosion is generally absent and carbon steel can be used for all equipment. Despite their advantages, the solvent processes have limitations, including their great affinity for heavy hydrocarbons, especially for aromatics. This means a loss in fuel value by the hydrocarbon rejected with the acid gas. In addition, the cost of the solvent is generally several times greater than that of the most common chemical absorbents. Recent developments in chemical absorption processes are also noted.

844 APTIC NUMBER 18003

Taheri, M. and G. F. Haines
OPTIMIZATION OF FACTORS AFFECTING SCRUBBER PERFORMANCE. J. Air Pollution Control Assoc., 19(6):427-431, June 1969. 9 refs.

Comparative gas cleaning performance of a pilot-scale venturi scrubber with throat dimensions of 6 in. wide x 12 in. long x 12 in. deep was obtained for the following three methods of water injection: System of spray nozzles located along each short side of the throat, continuous slot located immediately above the nozzles, along each short side of the throat, and were located 2 ft. above the spray nozzles along long side of the throat. For each method of water injection the gas cleaning performance, as a function of the pressure drop, was measured by two tests: Absorption of SO2 and collection efficiency for particles of methylene blue of controlled size. (Author's Abstract)

845 APTIC NUMBER 12478

Tamura, Zensuke
ADSORBENT PROCESS OF SULFUR DIOXIDE REMOVAL FROM FLUE GAS, USING ACTIVE CARBON. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1):39-40, 1967. Translated from Japanese. 7p.

The adsorption of sulfur dioxide from flue gas discharged from a boiler by using activated carbon was described. A test plant with a capacity of 2000 kw was built. The adsorbent process takes place as follows: adsorption of SO2, O2, and H2O from the flue gas conversion of the adsorbed SO2 to SO3 by catalysis; and formation of H2SO4 by hydration of the SO3, so that the original SO2 is adsorbed on the activated carbon in the form of H2SO4. The H2SO4 is easily extracted by washing with water. The activated carbon is thus regenerated and can be used repeatedly. The waste water containing the most concentrated sulfuric acid can be recovere as dilute sulfuric acid. Advantages of the process include a high percentage of sulfur removal, simple desorption and regeneration of the activated carbon, and a flue gas temperature of over 100 C. Drying of the activated carbon can be accomplished by the flue gas discharged from the boiler. The process can also be carried out without special conditions and is safe. Since the activated carbon is treated with dry distillation and high temperature steam, its firing point is higher than 400 C. Therefore, there is no danger of its firing during the desorption process with water-washing. In addition, the small amount of dust usually attached to fresh activated carbon can be removed from the apparatus by washing with water in the initial stage of the operation, so that explosions from carbon dust are avoided. Since the flue gas discharged from the air preheater on the boiler is treated directly and then emitted from the stack, no changes in the structure of the boiler are required.

846 APTIC NUMBER 12443

Thomas, Stanley
USE OF SOLID FUELS WITHOUT SMOKE EMISSION. Council for Scientific and Industrial Research, Pretoria (South Africa), Conf. Air Pollution, Capetown, South Africa, 1967, 36p. 3 refs. (Paper no. 2.)

Firing techniques and appliances which ensure the correct conditions for the efficient smokeless combustion of coal are discussed. These conditions include the provisions of sufficient air to enable combustible hydrocarbons to burn, sufficient turbulence to enable the air and the hydrocarbons to mix, sufficient time for the combustion process to completed, and a temperature high enough for the combustible gases to ignite. The mode of combustion, i.e., overfeeding or underfeeding, influences the smoke emission from a firebed. The mode of combustion is determined by the method of firing by hand or by the type of stoking appliance, if fired mechanically. While it is possible to hand fire most boilers with bituminous coal and at the same time comply with the provisions of the Atmospheric Pollution Act, it requires a great amount of skill on the part of boiler house personnel. Therefore, it is advisable to use either a smokeless fuel (anthracite, semi-anthracite, coke or char) for hand firing or to use one of the various types of mechanical stokers that are commercially available. The advantages of a mechanical stoker is that it fires steadily and consistently and can be operated mechanically. Moreover, as coal is fed in a steady stream, the air requirements for combustion can be precisely regulated. There is a mechanical stoker available for every type of boiler in operation today. Those discussed are the coking stoker, underfeed stoker, air modulating underfeed stoker, and fuel/air proportioning modulating stoker.

847 APTIC NUMBER 17329

Tohyama, Ioshio, Seiichi Takeuchi, and Tsutomu Nomura
DRY TYPE ELECTRIC PRECIPITATOR FOR NEGATIVE PRESSURE ENVIRONMENT OF EXPLOSIVE GAS. (Fukuhatsusei fuatsugasu shoriyo kanshiki denki shujinsochi). Text in Japanese. (Sumitomo Machine Industres, Osaka (Japan)) Japanese Pat. Sho44-12478, 4p., June 5, 1969. (Appl. Aug. 20, 1958, claims not given).

In general, explosive gases such as furnace, coke furnace, or closed-type carbide electric furnace gas are handled by electric precipitators in positive pressure environments or by wet electric precipitators that do not need hammering to avoid explosion. The gases have rarely been treated by dry-type electric precipitators in negative pressure environments. The electric precipitator is much more useful, however, in regard to its collecting efficiency and lifetime than other collectors. Gas is often required to be handled by the dry method, and in negative pressure environment, when a common air circuit is operated with other installations. A dry-type electric precipitator handling negative-pressure

explosive gas that satisfies the conditions of safe operation is described. The precipitator comprises a collecting part, an insulator chamber, flow regulate plates, hammering installations, an electric source, dust exhaust part, and a casing. The collecting part consists of collecting poles and discharge plates. The hammering installations are connected with the flow regulate plates, the collecting poles, and the discharge poles. The connection part is tightly sealed by a flexible joint to insulate the casing from the atmosphere and to conduct hammering vibration with higher efficiency. The insulator chamber is tightly sealed, to prevent dust from adhering to the insulator; there is no risk of explosion. The electric source is tightly sealed by the insulator. Double valves are employed in the dust exhaust section.

848 APTIC NUMBER 17399

Bureau of Capital City Development, Tokyo Metropolitan Government (Japan), Public Nuisance Div.
TESTS ON AUTOMOBILE EXHAUST GAS REGULATOR. (Jidosha haikigasu seigyosochi no jissha tesuto kekka ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(10):604-605, Oct. 15, 1967.

In a previous investigation, a platinum catalytic combustion system for regulating auto engine exhausts and crankcase ventilation air was tested on crankcase emissions. It was 100% and 93% efficient in removing CO and hydrocarbons, respectively, at idling; 96% and 80% efficient in removing CO and hydrocarbons at 1500 rpm of 20% load (equivalent to 40 km/h on a level ground at top-gear); and 33% efficient in CO removal at 1500 rpm of 50% load (equivalent to between 20 and 30 km/h on ascent). Further tests were undertaken to determine the suitability of the device for commercially produced motor vehicles. Data were obtained on the durability of the catalyst, the lifetime of the regulator, and the effects of the combustion system on the engine body. No inconveniences to an engine body was attributable to the installation of the catalyst combustion regulator. The suggested site for installation was under the carburetor. Waste gas pressure showed to be below 20 mm Hg to prevent horsepower from declining. The performance of the regulator and engine effectiveness are largely determined by the design of the venture which inhales secondary air. The rate of CO conversion obtained with the catalyst used varied between 10,000 km driving and 5000 km driving, with the average rate at 10,000 km 25% lower under the same temperature and same speed conditions. This means CO conversion rate delcines when the exhaust gas emission is of great quantity at maximum load and speed. Although its effectiveness depends on drive conditions, the regulator shows on average efficiency of 85.8% CO removal and 60% for hydrocarbon removal after a test drive of 5000 km. After 10,000 km the efficiency is 68.8% for CO removal, and 39.4% for hydrocarbon removal. The suitability of the catalyst combustion regulator for practical use will be determined by emission standards to be established by the Ministry of Transportation.

849 APTIC NUMBER 18002

Tomany, James P.
A SYSTEM FOR CONTROL OF ALUMINUM CHLORIDE FUMES. J. Air Pollution Control Assoc., 19(6):420-423, June 1969.

During primary aluminum processing the molten aluminum is periodically fluxed with chlorine to separate impurities from the metal. The gaseous effluent from the chlorination process contains submicron particulates and gaseous vapors which produce a dense, white pluse. The pluse is acidic with hydrogen chloride and chlorine vapors, which cause a variety of corrosion problems. Since the stack discharge temperature can range as low as 200 F -- and aluminum chloride sublimates at about 360 F, blockage of ductwork can also occur. For effective removal of both the particulates and chloride gases in the effluent, a sodium hydroxide solution is recommended. Since, such a scrubbing liquor produces a flocculent precipitate, a nonplugging type of scrubber is required. The solution UOP advanced was a "mobile packing" type of scrubber, utilizing a bed of polypropylene spheres in random, turbulent motion. The motion of the packing prevents plugging. The paper describes the design for such a system, describing the optimum use of ductwork, scrubber placement, gas saturation, and recirculation equipment. Instrumentation requirements, both minimum and optimum are discussed. A case study is detailed in which gases containing 5 gr/scf of particulates and 4 gr/scf of hydrochloric acid and chlorine vapors were passed through such a system. The cleaned effluent contained only 0.009 gr/scf of particulates and 0.002 gr/scf of vapors. (Author's Abstract)

850 APTIC NUMBER 12387

Turner, W. T. and M. Martin-Flaven
SOME METHODS OF CONTROLLING EXHAUST EMISSIONS DURING DECELERATION. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 7p. (Nov. 25-26, Paper 12.)

In modifying a 105 cu in. (1724 cu cm) engine to meet U. S. exhaust emission regulations, a deceleration control system was developed which could meet a target deceleration hydrocarbon emission of 800 ppm or less. The theoretical basis for high emissions during deceleration with an untreated engine is discussed, as well as the determination of steady-state parameters and the transient effects present in the first part of a deceleration. The essential features of the emission control system finally developed are: (a) the separate calibrated air bleed admitting a controlled quantity of air from the air cleaner into the system, which is tuned to operate at the slightly reduced vacuum thus created; (b) the single functional control valve; and (c) the enlarged pipe connecting the control valve to the manifold. This latter feature is essential to eliminate differences in depression between the manifold and control valve due to pressure drops in the control pipework. The average hydrocarbon emission level finally achieved for initial and secondary deceleration peaks is about 625 ppm.

851 APTIC NUMBER 12446

van Docrnum, G. A. W.
PROGRESS IN THE DEVELOPMENT OF SMOKELESS APPLIANCES FOR SOLID FUEL. Council for Scientific and Industrial Research, Pretoria

(South Africa), Conference on Air Pollution Capetown, South Africa, 1967, 13p. (Paper no. 6.)

Appliances are described that permit the virtually smokeless combustion of bituminous coal in domestic heaters and industrial boilers. The design of the domestic appliance is characterized by a separate bunker for the storage of fuel, a provision that makes it possible to replenish the fuel supply of a stove without intertering with the combustion process. Preheated secondary air, well distributed, is admitted in an insulated combustion chamber. The hot combustion products can be used for space or water heating or to heat an oven or hot-plate. The same principle can be applied on a larger scale, and hot water generators suitable for apartment buildings are now being manufactured. On an industrial scale verticle boiler with secondary air supply, smoke generation is almost completely reduced by injecting air through a small forge blower. Another boiler modification described facilitates ash removal frca a boiler.

852 APTIC NUMBER 11976

Veverka, V.
PROPOSAL OF AMMONIAC DESULPHURIZING FOR 100 MW. In: Preprints of the Czechoslcvak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 23-29.

A bicyclic ammoniacal method of desulfurizing thermal power plant flue gases is currently under study in Czechoslcvakia. The proposed capacity of available equipment corresponds to the 100 MW power plant block and is considered the highest that can be attained at this time. Presumably, the equipment could be rendered suitable for greater power plant capacities by connecting parallel lines. According to the proposed method, combustion products in quantities of approximately 500,000 cu nm/hr, and containing 0.15 to 0.30 mol% SO2, are cooled, washed in two stages, reheated, and then drawn off to the stack. Regeneration of the solution, SO2 desorption, and crystallization of NH4(2)SO4 are included in the circuit of the first regeneration stage. The condensate resulting from the cooling of the desorbed SO2 is conveyed simultaneously with fresh water to the 2nd absorption circuit, where fresh ammonia is introduced. The diluted solution from the 2nd circuit is recycled to the 1st circuit. Cooling of combustion products and fly-ash liquidation are problem areas of the desulfurization process. Cooling to 35 C is essential. It is proposed to cool the combustion products in two stages, first by desulfurized vapors and then by cold air. A wet fly-ash separator will be installed between the first and second stage coolers. Other technical and economic problems remain to be solved before the process is ready for large-scale application.

853 APTIC NUMBER 16901

Vlcek, V., V. Vavra, and M. Stary
OPTIMIZATION OF CONDITIONS FOR FOAM-PHASE ABSORPTION OF SULFUR TRIOXIDE. Int. Chem. Eng., 2(2):216-220, April 1962. 5 refs.

Optimum conditions for sulfur trioxide absorption in the foam phase (the two-phase form of extremely high contact between gas and liquid) were determined with pilot plant equipment attached to a commercial sulfuric acid plant. The influence of gas velocity, liquid flow rate, height of weir, and type of trays was considered, and attempts were made to compare the efficiency of foam-phase absorption with that of packed towers. The work shows that it is not possible to compare various types of absorbers according to absorption efficiency or absorption coefficients. Similarly, the efficiency of equipment and the power used for gas-liquid contact are only partial indicators of absorption efficiency. A complex criterion is suggested which incorporates all partial indicators and represents production costs referred to the absorption step. Optimum conditions are defined as the minimum value of these costs which include those of pumping and blowing liquid, the cost of SO3 losses, investment related to production costs, and the cost of monohydrate absorption. Experimental results and comparative costs of absorption are tabulated. The foam-phase absorption unit is represented by a schematic drawing.

854 APTIC NUMBER 17409

Walther, J. E. and H. R. Amberg
ODOR CONTROL IN THE KRAFT PULP INDUSTRY. Chem. Eng. Progr., 66(3):73-80, March 1970. 12 refs.

As determined by year-long odor inventories at four West Coast kraft mills, present technology will permit reduction of total sulfur compounds by 90-94%. High efficiency oxidation of black liquor should reduce sulfur emissions from the recovery furnace to about 0.1 lbs/AD ton of pulp. Emissions as low as 0.01 lbs/AD ton of pulp could be achieved by eliminating direct contact of hot flue gas and black liquor in accordance with two new systems. One system relies on concentrating the black liquor in multiple-effect evaporators to the desired concentration for direct firing to the furnace. The other systems use the hot flue gases from the recovery furnace to heat air in a laminar flow heater. This heated air is passed through a conventional cascade evaporator to raise the solids content of the black liquor coming from the multiple-effect evaporators to the concentration desired for firing in the furnace. Burning of noncondensable gases from digesters and multiple-effect evaporators in the lime kiln, recovery furnace, or incinerator is a positive method of completely eliminating this source of odors. The lime kiln can be operated at daily hydrogen sulfide emissions as low as 0.06 lbs/ton of AD pulp. Miscellaneous source odors are the washer hood vent gas, the washer filtrate seal tank gas, and the knotter hood vent gas. Although their concentration is relatively low, the volume of reduced sulfur compounds is these streams can be substantial. This area will require considerable research and development work before a completely satisfactory solution is found.

855 APTIC NUMBER 16892

Wangerin, D. D.
ARE WE GETTING THE MOST OUT OF BY-PRODUCT FUELS. Combustion, 40(10):37-44, April 1969. 14 refs.

By-product fuels are used in industry wherever management has been

able to justify capital expenditures. Adequate return on investment can often be supported by reduced fuel costs and, in some cases, chemical recovery. More efficient use of by-product fuels can be realized by refined operating techniques and equipment modernization. There are situations, however, where we are not getting the most out of by-product fuels simply by nonuse. Due to impending air and water pollution regulations, many plants will be forced to incinerate their waste products or shut down their main product facility. (Author Abstract)

856 APTIC NUMBER 16863

Wein, W.
OPERATING EXPERIENCE WITH POWER PLANT STACKS AND THEIR DESIGN. Combustion, 41(4):29-34, Oct. 1969.

The requirement for cleaner air has led to the construction of very high power plant stacks in recent years. Some types of design that have been used in stack construction in Germany are discussed. Sources of damage especially in older stacks include: excessive thermal stresses, too short a drying or heat up time, and corrosion due to temperatures below the dew point. Some of the characteristic damages resulting from these conditions and remedies that can be applied are outlined.

857 APTIC NUMBER 17394

Yano, Junichi
AIR CLEANING IN HOSPITALS -- THE STATE OF THE ART. (Byoin no sukin kucho (Kuki seijoka eno koko). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 7(5): 19-22, Jan. 1, 1970. 1 ref.

Results derived from tests of the efficiency of several air filters and conditioners are presented. A typical system, most widely used in hospitals, is an air cleaning unit consisting of a glass wool filter an an electric dust collector. The specified collection rate of the unit is more than 90% for 300 dust particles, ranging from 0.01 micron to 10 micron, in 1 cu m of air. One hospital proved the efficiency of the unit by installing a Cambridge Filter (Absolute D Type) in addition to both the electric dust collector and an air filter. Procedures involved in the test included measurement of dust deposition by an exposure method and cultivation of collected bacteria in an agar medium at 37 C temperature for 48 hrs. The number counted was two before the application of the Cambridge Filter and none with the filter. Interior air quality standards in hospitals are based on the respective densities of carbon dioxide, carbon monoxide, and sulfur oxides along with a number of dust depositions. To purify sulfur oxides, the air conditioner should be a type of all-round system; to decrease bacteria and dusts, a ventilator should be added to the electric dust collector. Exclusion of sulfur oxides inflow into a room is made possible by the use of activated carbon. From environmental hygienics the viewpoint of the problem respresentative of most hospitals is predominantly carbon dioxide density. In a small room without benefit of ventilation from the outside and not equipped with an air conditioner, a patient often complains of headache and unpleasantness. Investigation of the CO problem in hospitals at night when all the ventilators or air filters are stopped indicates that the occurrence of air containing 0.06% CO coincides with the turning off of this equipment at 5:00 pm. The CO content reaches 0.5% by 5:00 the following morning.

858 APTIC NUMBER 11996

Zahradnik, Lubomir and Jan Mazacek
OBTAINING TRACE AND RARE ELEMENTS FROM POWER PLANT FLY ASH. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 237-244.

The utilization of power plant fly ash for the production of rare and trace elements, such as germanium, gallium, beryllium, vanadium, boron, and uranium is discussed. The elements are present in the fly ash produced by the combustion of coal in chambers where absorption of ash by the slag is high. The accumulation of the trace and rare elements in the ash matter depends on the volatility of their compounds produced by chemical reactions occurring during combustion. Germanium and gallium show the highest degree of enrichment of all trace and rare elements. Germanium is converted during combustion to volatile germanium monoxide, germanium monosulfide, and germanium disulfide. Treatable concentrations of both germanium and gallium are obtained in cyclone slag-top furnaces and boilers with straight gates. Their accumulation in fly ash may be due to surface sorption. On the other hand, the presence of beryllium and uranium is influenced by the disintegration and escape of vitrain components to the organic matter to which both metals are bonded. In grate and cyclone furnaces, a two-stage dust collecting system is used for germanium- or gallium-containing fly ash; a mechanical separator sorts out gross fly ash components and an electrostatic precipitator effectively absorbs the fine fly ash components.

859 APTIC NUMBER 16872

Zentgraf, K. M.
THE PRESENT STATE OF FLUE GAS DESULPHURIZATION. Combustion, 41(5): 6-11, Nov. 1969.

A very large number of methods for the desulphurization of flue gas from power plants are known and new concepts are being continuously developed. Only a few of these methods, however, have extended beyond the theoretical proposal or a laboratory test. Methods are discussed here which have progressed further than most concepts and which are being tested in prototype units or actual power plants. Furthermore, the operating costs of these methods are discussed as well as flue gas problems related to the wet scrubbing method. Of the ten methods tabulated, six methods, which also yield a marketable product have specific investment costs of between 43 and 85 DM/KW hr. To maintain the operating costs of such plants within bearable limits, the degree of desulfurization as well as the sulfur content of the fuel must be high. This way the fixed cost portion can be reduced and income from the end product--if easily marketable--could be high. If high sulfur containing fuel could be obtained at a discount--as practices already in the USA--these savings would also benefit

the desulfurization process. The rest of the methods given in Table 2, whose costs are below 17 DM/KW hr, are suited especially for low plant load factors.

860 APTIC NUMBER 17338

Zielke, Clyde W., Howard E. Lebovitz, Robert T. Struck, and Everett Gorin
SULFUR REMOVAL DURING COMBUSTION OF SOLID FUELS IN A FLUIDIZED BED OF DOLOMITE. J. Air Pollution Control Assoc., 20(3):164-169, March 1970. 8 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry, National Meeting, 158th, New York, Sept. 7-12, 1969.)

Sulfur removal during combustion of coal or low-temperature coal char using excess air in a fluidized bed of dolomite was demonstrated in a continuous bench scale unit. The sulfur dioxide produced during the combustion is fixed as calcium sulfate by reaction with calcium oxide in the dolomite as follows: CaO + SO2 + 0.5 O2 yields CaSO4. The ranges of conditions explored were calcium oxide-to-feed sulfur mol ratios in the range of 1 to 8, fluidizing velocities of 1.5 and 3.0 ft/sec, superficial gas residence times of 1 and 2 sec, and temperatures from 1700 to 1900 F, with 120% stoichiometric air at the operating pressure of 8 psig. The process was operable at all conditions studied using a highly caking Pittsburgh seam coal as well as two low-temperature chars. Desulfurization efficiency with a Ca-to-S mol ratio of 1 was 78%; at Ca-to-S ratios of 2 or higher desulfurization efficiency exceeded 90%. Continuous regeneration of the sulfated dolomite using partial combustion of carbon monoxide gas at 1950 F was also demonstrated. As high as 97% of the sulfur in the dolomite was liberated as SO2 by this treatment giving a gas that contained SO2 concentrations as high as 23 times that in the combustion gases. Dolomite life was investigated, with the dolomite subjected alternately to SO2 absorption during combustion and subsequent regeneration. It was demonstrated that by regeneration and re-use of the dolomite, the ultimate SO2 capacity can be extended in excess of four times that for a once-through process. Regeneration also permits recovery of elemental sulfur by processing the SO2-rich regenerator off-gas. (Author abstract modified)

861 APTIC NUMBER 18011

Adams, D. F. and R. K. Koppe
INSTRUMENTING LIGHT AIRCRAFT FOR AIR POLLUTION RESEARCH. J. Air Pollution Control Assoc., 19(6):410-415, June 1969. 10 refs.

Light aircraft and helicopters have been occasionally used to conduct aerial traverses for a single pollutant or atmospheric tracer. The continuous analyzer or sample collector is temporarily tied down with a seat belt or hand held. Flight variables are visually observed and written on the recorder chart, a notebook, or possibly voice-recorded on a portable tape recorder. The versatile airborne instrumentation package described can measure and record up to 27 pollutant and flight variables from a Cessna Skymaster center-line thrust, light twin. Real-time analysis instrumentation include non-dispersive infrared analyzers for CO2, CO, and hydrocarbons, conductivity and coulometric analyzers for SO2 and sulfur-containing gases, and Charlson-Ahlquist visual range nephelometer. A Battelle "bulk sampler" is used to collect particulates for weighing and microscopic examination. Indicated air speed, altitude, rate of climb, magnetic heading, temperature, and relative humidity are continuously measured. All variables are sequentially recorded on a 7-track, 200 bit/sec, 27-channel, magnetic tape data logging system. Measured variables are recorded once each 0.3 to 0.8 sec--equivalent to 33-100 ft. of traverse--depending upon the number of variables recorded (i.e., between 9 and 27) when flying at 90 mph. Tape data are reduced directly by IBM 360 computer to a digital print-out or from tape to an X-Y analog plot. (Authors Abstract)

862 APTIC NUMBER 12362

Altshuller, A. P., S. L. Kopczynski, W. A. Lonneman, and F. D. Sutterfield
A TECHNIQUE FOR MEASURING PHOTOCHEMICAL REACTIONS IN ATMOSPHERIC SAMPLES. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 15p., May 1969. 12 refs.

Photochemical experiments were conducted on samples collected from the atmosphere in downtown Los Angeles during the morning traffic peak hours. The samples were collected in large, plastic containers fabricated from film transparent to solar radiation. The samples were analyzed, irradiated with solar radiation for 2-3 hours at ambient temperatures, reanalyzed, irradiated again for 2-3 hours, and reanalyzed. Analyses were made for aliphatic hydrocarbons, aromatic hydrocarbons, total hydrocarbon, nitric oxide, nitrogen dioxide, oxidant, formaldehyde, peroxyacetyl nitrate,and carbon monoxide. The separation on the pollutants was described. The maximum oxidant values obtained agreed reasonably well with those obtained at several air monitoring stations. The results clearly indicated the value of large plastic reaction containers in investigating the kinetic behavior of atmospheric samples at ambient temperatures with solar radiation.

863 APTIC NUMBER 12136

Altshuller, A. P., L. J. Lage, and A. F. Wartburg
SOURCE AND ATMOSPHERIC ANALYSES FOR FORMALDEHYDE BY CHROMOTROPIC ACID PROCEDURES. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Lab. of Engineering and Physical Sciences, 17p., 1962 (?). 7 refs.

A variation of the chromotropic acid method of formaldehyde analysis was investigated, which employs direct collection and color formation in a 0.1% chromotropic acid solution in concentrated sulfuric acid, instead of the usual method involving preliminary collection in a bubbler containing an aqueous bisulfite solution or just water. A brief study was also made of the use of an aqueous solution of chromotropic acid. The aqueous procedure is not useable in analyses of diesel or incinerator effluents; the acid procedure is not applicable to raw and diluted auto exhaust, but both can be used to analyze synthetic and actual photochemical smog. Because of its much higher sensitivity, the acid procedure is convenient for formaldehyde analysis, even when the formaldehyde levels are only a few parts per hundred million by volume. At these concentration levels and below, the use of optical cells of 5-cm path length are advisable. Thus, for trace gas analyses, direct collection in acid solution provides a more sensitive procedure that those various formaldehyde and aldehyde analytical methods that involve a 1-to-10 dilution step.

864 APTIC NUMBER 11668

Barrett, Earl W.
LASER MEASUREMENT OF AIR POLLUTION PARAMETERS (TERMINAL PROGRESS REPORT). Northwestern Univ., Evanston, Ill., Technological Inst., Grant 5-R01 AP00401-02, 28p., March 10, 1968. 25 refs.

The feasibility of using a laser radar (lidar) system for remote measurements of the amount and spatial distribution of suspended particulates in the atmosphere was investigated during five episodes of extended inversion. The investigations were accompanied by the development of a mathematical technique for quantitative conversion of the primary measured data (the backscattering coefficient per unit volume of air as a function of height) into directly useful numbers. The results show that a lidar can be used to monitor the depth of the polluted layer in an urban region at intervals of one min or more on a continuous basis, provided no fog, clouds, or ice crystals are present in or just above the mixing layer. With appropriate algorithms, soundings of particulate concentration, horizontal visibility, and Linke turbidity index as functions of height can be obtained. A mobile lidar, with dirigibility in azimuth and elevation, can be used for monitoring individual stack plumes, provided the minimum thickness of the plume is greater than half the lidar pulse length in space. Though the maintenance of a lidar presents problems and atmospheric water interferes with particulate measurement, the lidar has immediate and great utility in both routine and research work in the measurement of atmospheric turbidity and solid pollution. The usefulness of the lidar is illustrated by a discussion of four cross-sections of particulate concentration as a function of time and elevation. These cases show that the distribution of pollutants over an urban area is strongly influenced by mesoscale eddies, with their associated fields of convergence and divergence.

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865 APTIC NUMBER 11861

Basargin, N. N. and N. A. Nikitina
RAPID TITRATION METHOD FOR THE DETERMINATION OF SULFATE ION IN PHOSPHORIC ACID WITH NITCHROMAZO INDICATOR. (Ekspressnyi titrimetricheski metod opredeleniia sul'fat-iona v fosfornoi kislote s indikatorom nitkhromazo). Zavodsk. Lab. (Moscow), 32(5):517-519, 1966. 5 refs. Translated from Russian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 6p.

A rapid volumetric method is described for the determination of sulfate ions in phosphoric acid obtained by extraction. The method is based on direct titration of sulfate ion by barium salt at pH 1.7-2 in a 40-50% alcoholic solution, in the presence of Nitchromazo indicator and phosphate ions. The determination time is 15 min. Because of its rapidity, dependability, and accuracy, the method is recommended for serial analyses in the control of phosphoric acid production by the extraction process. It may also be used with some modifications in the analysis of phosphoric fertilizers. Automatization of the method is possible in the future. (Author summary modified)

866 APTIC NUMBER 12321

Basargin, N. N. and K. F. Novikova
TITRATION MICROMETHOD FOR THE DETERMINATION OF SULFUR IN ORGANIC COMPOUNDS PHOSPHOROUS AND ARSENIC UTILIZING THE NEW INDICATOR NITCHROMAZO. (Titrimetricheskii mikrometod opredeleniia sery v fosfor- i mysh'iaksoderzhashchikh organicheskikh soedineniiakh s novym indikatorom nitkhromazo). Zh. Analit. Khim. (Moscow), 21(4):473-478, 1966. 14 refs. Translated from Russian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 13p.

A rapid titrometric method for determining sulfur in the presence of phosphate and arsenic ions utilizing the new barium indicator Nitchromazo (2,7-bis-(4-nitro-2-sulfobenzol-1-azo)-1,8-dihydrooxynapthalene-3,6-disulfonic acid) is described. The test compound is first decomposed by the Schoeniger method and then titrated with barium salt in the presence of the indicator. A sharp and sensitive reaction with barium occurs at pH 1.7-2.0, eliminating phosphate interference completely and arsenate and chromate interference, partially. Such determinations exhibit a standard deviation of plus or minus 0.3. Analytical characteristics and synthesis of Nitchromazo are also described. (Author summary modified)

867 APTIC NUMBER 18017

Boulerice, M. and W. Brabant
NEW PbO2 SUPPORT FOR THE MEASUREMENT OF SULFATION. J. Air Pollution Control Assoc., 19(6):432-434, June 1969. 8 refs.

Since 1966, the Division of Laboratories of the Department of Health of the City of Montreal is carrying on measurements of gaseous pollution, a new lead dioxide support for the determination of sulfur dioxide has been devised. The preparation of candles according to the standard method requires much time and skill from the operator, whereas the technique that is proposed is rapid, easy, and provides plates of a high degree of uniformity. A technician with little experience can coat a great number of plates per day with no difficulty. The technique which consists of coating the inside of a plastic Petri dish with a PbO2 paste also has the above mentioned advantages. The plates that are suggested allow a simplification of the preliminary work for several types of analyses such as gravimetry, colorimetry, turbidimetry, titrimetry, and nephelometry. (Author's Abstract)

868 APTIC NUMBER 11819

Breuer, Wolfram
NEW METHODS OF CONTINUOUS TRACE GAS ANALYSIS. (Neue Verfahren zu kontinuierlichen Spurenanalyse). Preprint, 23p., 1968. 2 refs. (Presented at the Interkama Kongre, 4th, Duesseldorf, Germany, 1968.) Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 23p.

Electrochemical trace gas measuring units for determining the concentration of pollutants in the open air are described. The units operate on the principle of a galvanic chain, indicating concentration changes of ions in a solution caused by reaction with a sampled trace gas. The sampling gas and the solution are held by a solid electrolyte cast into a cylindrical silver tube which serves as an anode. The cathode is embedded in the inner surface of the electrolyte in the form of a silver helix. Electrical connections for both electrodes run through a polyethylene stopper at the bottom of the tube. The flow of sampled gas reaches the actual measuring zone, the inner surface of the electrolyte, through a glass line and a polyethylene stopper at the top of the tube. The measuring ranges of standard units extend from several ppb (dilution of 10 to the minus 9th power) to several ppm (dilution of 0.000001, depending on the gas component. Concentration cells are now available for analysis of hydrogen sulfide, nitrogen dioxide, nitrogen dioxide and nitric oxide, phosgene, hydrogen cyanide, chlorine, oxygen, and ozone.

869 APTIC NUMBER 12401

Brown, Paul M. and Dietrich Hochrainer
CONICAL AEROSOL SPECTROMETER. CYCLINDRICAL AEROSOL SPECTROMETER. National Center for Atmospheric Research, Boulder, Colo., NSF Contract C-860, 5p., 1969.
CFSTI: PB 180880

Both the Conical and Cylindrical Aerosol Spectrometers are rotating instruments that separate solid or liquid airborne particles by size. In each instrument, the radius of the intake nozzle is smaller than that of exhaust nozzles; because of this difference, air flows through the instrument when it is rotated. During rotation, a centrifugal force is imposed on particles, causing them to migrate to an inner surface where they are collected on metal or paper foil. Larger particles are deposited on the area of foil nearest the ring-slit through which air flows. Preferred materials for the instruments, which are illustrated schematically, are

aluminum or magnesium for the conical version and aluminum, magnesium, or brass for the cylindrical version.

870 APTIC NUMBER 18007

Burnham, Carole D., Carl E. Moore, Eugene Kanabrocki, and Don M. Hattori
DETERMINATION OF LEAD IN AIRBORNE PARTICULATES IN CHICAGO AND COOK COUNTY, ILLINOIS, BY ATOMIC ABSORPTION SPECTROSCOPY. Environ. Sci. Technol., 3(5):472-475, May 1969. 12 refs.

A simple precise procedure for determining the lead content of suspended particulate samples collected from the air uses atomic absorption spectroscopy. It is necessary to utilize the standard additions technique to overcome matrix effects. Analyses of 38 samples collected in the Chicago and Cook County area on March 31, 1966, as a part of the National Air Sampling Network, yielded values from 0.10 to 3.18 micrograms of Pb per cubic meter of air. Results obtained by the referee method of polarography showed substantial agreement with atomic absorption values. Possibilities of employing atomic absorption for the determination of other metals found in suspended particulates are currently being investigated. (Author's Abstract)

871 APTIC NUMBER 17386

Byers, R. Lee and John W. Davis
SULFUR DIOXIDE ADSORPTION AND DESORPTION ON VARIOUS FILTER MEDIA. J. Air Pollution Control Assoc., 20(4):236-238, April 1970. 2 refs.

Atmospheric sampling for gaseous pollutants usually requires removal of suspended particulates preceding the gas sampler. Experiments were performed to determine the extent to which sulfur dioxide is adsorbed on various materials of filter holders and filters used for the removal of the particulates. Atmospheric concentrations of sulfur dioxide (0.05 and 0.10) were passed through plastic, aluminum, stainless steel, and Teflon filter holders with and without membrane and glass fiber filters in place. Plastic holders with membrane filters adsorbed very little sulfur dioxide; Teflon, stainless steel, and aluminum removed increasing amounts. Glass fiber filters cannot be recommended. Adsorption of sulfur dioxide was markedly increased in all cases when the relative humidity was increased from 10 to 50%, with adsorption on the filter holder more affected by increasing humidity than adsorption on the filter, except for the glass fiber filter. All materials studied would be satisfactory for sampling sulfur dioxide if a long sampling time is not objectionable. For short sampling times and peak concentrations, a plastic holder with a membrane filter is recommended. (Author abstract modified)

872 APTIC NUMBER 11687

Caretto, Laurence S.
CHEMICAL ANALYSIS OF AIR POLLUTION SOURCES. Preprint, California Univ., Berkeley, Thermal Systems Div., 34p., June 1967. 31 refs.

(Prepared for the Engineering Extension, College of Engineering, Course Combustion Generated Air Pollution.)

Various analytical techniques applicable to exhaust gases are evaluated. Flame ionization offers a rapid and accurate method for measuring the total hydrocarbon concentrations in exhaust streams from combustion devices; however special precautions are necessary if the stream contains an unusually large amount of oxygen. Gas chromatography is perhaps the best method in terms of accuracy and definite qualitative identification of compounds, although limited to batch sampling procedures. Infrared spectrometric analysis is applicable to non-homopolar species with a limited sensitivity of about 10 ppm, while visible/ultraviolet spectrometry is applicable to all species; both can be used with continuous or batch sampling and are rapid techniques. The mass spectrometer is a powerful analytical tool which has been very useful in laboratory flame studies and is a practical device for exhaust studies. The combination of gas chromatography and mass spectrometry provides a tool which could possibly separate and identify almost all the components in an exhaust gas stream. Two wet chemical techniques, the phenodisulfonic acid method and the Saltzman method, both used to analyze nitrogen oxides, are generally slow, but have been long used and tested. It is concluded that means are available for the accurate analysis of total and individual hydrocarbons, carbon monoxide, and carbon dioxide, but not for nitrogen oxides. A preliminary discussion of batch and continuous sampling techniques concludes that, at present, there is no sure sampling system that can be guaranteed to deliver a representative sample to the analysis step.

873 APTIC NUMBER 12437

Carpenter, R. O., C. Schuler, and J. Pressman
ATMOSPHERIC NITRIC OXIDE MEASUREMENT TECHNIQUES (FINAL REPORT). GCA Corp., Bedford, Mass., Technology Div., Contract NAS12-85, GCA-TR-68-18-N, 87p., Nov. 1968. 80 refs.
CFSTI: N69 16504

A three-phase program is described to investigate and develop a suitable laser technique for measuring the vertical number density distribution of neutral nitric oxide in the atmosphere. A theoretical study was made to determine transitions of the ambient atmospheric NO molecule which offered the greatest promise for laser probing by the resonance scattering mechanism. This study centered on calculations of the ratio of integrated resonance scattering cross section to the Rayleigh scattering cross section; it was concluded that operations would have to be restricted to the far ultraviolet or far infrared. A developmental program was carried out to examine various methods for producing laser radiation from NO gas at transitions where the terminal state both corresponded to a well-populated state in atmospheric NO and whose characteristics made probing possible. Results showed that operating a direct NO laser at either far UV or far IR is not now practical. Experimental work was performed involving the shift-tuning of known high power lasers using harmonic generation, sum frequency generation, stimulated Raman shifting, and parametric oscillation. These techniques appear to offer reasonable means of generating radiation at the lines of interest. Detailed evaluations are given of the two optimum probe wavelengths for shift-tuning: UV 2155 A and IR 5.33 micron. (Author summary modified)

874 APTIC NUMBER 11602

Chu, Chieh and Natverlal K. Patel
FUNDAMENTAL STUDIES IN COMBUSTION KINETICS. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 29-35, Sept. 1968. 9 refs.

Experimental jet diffusion flame equipment for studying combustion processes of interest to air pollution is described. The equipment consists of two reactant supply lines and two burners constructed of adjustable brass tubes. Temperature distribution inside a flame is measured by a Pt-Pt-10% thermocouple whose location within the flame is pinpointed by a micromanipulator capable of measuring distances accurately in three perpendicular directions. Successful preliminary experiments were conducted using an oxygen-nitrogen mixture as the oxidant and a methane-nitrogen or an ethylene-nitrogen mixture as the fuel. Typical methane and ethylene isotherms are shown, constructed from temperature measurements along a vertical plane passing through the axis of the brass cylinders. They are almost horizontal in the major part of the flame and show wide variations in maximum flame temperature. Further interpretation of the data obtained awaits a theoretical analysis of the chemical and physical processes involved.

875 APTIC NUMBER 12207

Church, H. W., R. E. Luna, J. W. Reed, and H. G. Booth
AN AUTOMATED METEOROLOGICAL MEASUREMENT SYSTEM. Sandia Corp., Albuquerque, N. Mex., Symp. Theory Measurement Atmospheric Turbulence Diffusion Planetary Boundary Layer, Albuquerque, N. Mex., 1967, p. 153-163. (Dec. 5-7.)

The instrumentation of two high towers for determining boundary layer turbulent diffusion was described. Tower instrumentation is needed for high quality micrometeorological measurements for use in operational, climatological, and research applications. Information on thermal stability and wind character, including means and time and space variability, is needed for test site operational predictions of contaminant dilution and low level airblast propagation. Descriptions were given of the site geography, sensors, signal conditioning, information output, calibration and error identification, data processing and manipulation, and project status. The towers involved were a 1500-ft tower at Jackass Flats, Nevada and a 500-ft meteorological tower 15 miles from Yucca Flats, Nevada. The dual purpose of the towers lead to a combined analog-digital system, the principal element of which is a general purpose computer. The analog presentation along with the digital output of certain computed quantities will satisfy operational requirements. Research requirements will be met by the use of analog records for the identification of appropriate steady state conditions and by the complete flexibility in programming the computations and digital printout of the computer. Thus, routine pre-processing of raw data through use of the reserve capacity of the data-gathering computer will permit reduction of stored data volume while retaining maximum information content. One method under consideration is the conversion of turbulent components to correlation functions and the computation of averages over various time spans. In addition, the computer will provide capability for programming a wide variety of special research problems utilizing the raw data.

876 APTIC NUMBER 16850

Collis, R. T. H.
LIDAR FOR ROUTINE METEOROLOGICAL OBSERVATIONS. Bull. Am. Meteorol. Soc., 50(9):688-694, Sept. 1969. 18 refs.

Lidar, using pulsed lasers as energy sources, applies the radar principle at wavelengths in and near the visual spectrum to probe the atmosphere. It can detect particulate matter of much smaller dimensions and sparser concentration than is possible with meteorological radar. Lidar may be used to measure cloud base heights although difficulties arise with diffuse clouds, especially in foggy conditions. Inhomogeneities in turbidity that occur at the heights of temperature inversions in the relatively clear atmosphere are also revealed by lidar. Examples of work in progress that show promise of providing a measurement of visibility are presented. It is concluded that lidar can already contribute usefully in routine meteorological service, but that its full potential in ceilometry and visibility measurement awaits further developments. For routine unattended use, high pulse-rate low peak-power lidars are advocated on grounds of safety. (Author's Abstract)

877 APTIC NUMBER 12429

Crider, Walter L., Naomi P. Barkley, Marta J. Knott, and Robert W. Slater, Jr.
HYDROGEN FLAME CHEMILUMINESCENCE DETECTOR FOR SULFATE IN AQUEOUS SOLUTIONS. Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 12p., 1969 (?). 14 refs.

An aerosol-passing gas adsorber (APGA) is described that detects sulfate ions in aqueous solution at concentrations as low as two micrograms SO4 minus two milliliter of solution. The APGA, based on the principle of chemiluminescence of sulfur in a hydrogen-rich hydrogen-air flame, selectively removes water from a nebulized sample while permitting the passage of nonvolatile sulfate particles to the detector. The instrument is demonstrated to be of specific value in the hydrogen peroxide method for sulfur dioxide analysis. When used in conjunction with this analytical procedure, the detection limit for SO2 collected in one-hr samples is estimated to be 0.03 ppm. The APGA is competitive in sensitivity with both the turbidimetric (50 micrograms of sulfate) and nephelometric (two micrograms of sulfate) analytical procedures. Analysis for sulfate is easier and faster with the instrument than by the turbidimetric barium sulfate method.

878 APTIC NUMBER 12412

Cross, C. W. and F. H. Swann
DETECTION OF OXYGENATED ORGANIC COMPOUNDS IN ENAMEL SOLVENTS AND THINNERS. (FINAL REPORT). Army Coating and Chemical Lab.,

Aberdeen Proving Ground, Md., AMCMS CODE 5025.11.29500, Proj. 1T062105A329, CCL Rept. 257, 4p., Jan. 1969. 4 refs.
CFSTI, DDC: AD 680953

A simple, rapid, and dependable test is described for detecting ketones, esters, alcohols, etc. in paint thinners and solvents at concentrations as low as 1%, using a new application of thin layer chromatography. The test involves the vertical movement of a spot of dye from the bottom of a fiberglass strip pre-coated with silica gel, when suspended in a developing cylinder containing 15 ml of the solvent to be tested. The oxygenated solvents in the test solution are held more strongly than hydrocarbons by the silica gel, and then travel more slowly up the surface to become concentrated in the area of the dye. A streak of dye becomes visible as the oxygenated solvent travels upward; the selected dye is insoluble in hydrocarbons but soluble in polar solvents. Total time required is 10-15 min if the test strips are prepared in advance by spotting with dye, drying in an oven, and storing in a desiccator. The procedure will be useful in facilitating subsequent quantitative analysis required by air pollution abatement regulations.

879 APTIC NUMBER 12510

Dealy, James O.
SOURCE SAMPLING REQUIREMENTS FOR FOSSIL-FUEL-FIRED STEAM-ELECTRIC PLANTS. Preprint, National Air Pollution Control Administration, Durham, N. C., Div. of Abatement, 26p., May 1969. 10 refs. (Presented at the Rural Electric Generating Conference, 20th Annual, Denver, Colorado, June 2-5, 1969.)

Source sampling requirements for steam electric plants fired with fossil fuels are described in detail. Source sampling is divided into 4 main tasks: preliminary studies, actual testing, laboratory analysis, and preparation of a final report. Preliminary studies consist of emission factors, emission standards, test methods, location of a good sampling point, operating conditions of the plant, and the type and amount of fuel burned. The second task of source sampling begins with the transportation of sampling equipment to the test points. Before the actual test begins, one or more preliminary test runs are conducted. The information from the preliminary tests is used to adjust the sampling train in order to achieve accuracy when the actual test is performed. Power-plant source sampling processes are classified in two ways: sampling for gaseous contaminants, and sampling for particulate impurities. The testing for particulates and sulfur dioxide was discussed. In depth consideration was given to sampling procedures, sample train cleanup, and analytical techniques for determining the actual amount of sample collected.

880 APTIC NUMBER 16852

Dickson, C. R., G. E. Start, and E. H. Markee, Jr.
AERODYNAMIC EFFECTS OF THE EBR-II REACTOR COMPLEX ON EFFLUENT CONCENTRATION. Nucl. Safety, 10(3):228-242, May-June 1969. 9 refs.

Information about the atmospheric quality downwind from nuclear reactors has become increasingly important because all new power reactor proposals specify roof vents or stub stacks rather than separate tall stacks. Dispersion of a tracer released from the downwind side of the Experimental Breeder Reactor II (EBR-II) was measured in stable and unstable atmospheres. The tracer, uranine dye, was sampled on five concentric sampling arcs between 30 and 600 m from the release point. The average tracer concentrations at the plume center were proportional to the -0.6 power of distance downwind. The downwind-to-upwind ratios of the product of vertical and horizontal turbulence indices were calculated from bivane data records. At 100 m downwind the ratio exceeded 15 for some 5-min data records and averaged 5 for the 30-min records. The horizontal wind speed immediately downwind in the wake of the reactor complex averaged about one-half the horizontal speed upwind of the complex. The diffusion rate in the EBR-II wake converged to the "free" atmosphere rate between 400 and 600 m downwind of the source point. (Author's Abstract, Modified)

881 APTIC NUMBER 12303

Dikun, P. P.
DETECTION OF POLYCYCLIC AROMATIC HYDROCARBONS IN POLLUTED ATMOSPHERE AND OF OTHER POLLUTANTS BY MEANS OF QUASILINEAR FLUORESCENCE SPECTRA. (Obnaruzheniye policiklicheskikh aromaticheskikh uglevodorodov v zagryaznenivakh atmosfernogo vozdukha i drugikh ob'yektakh s pomosch'yu kvaziliney chatykh spektrov fluorestsentsii). Text in Russian. Zh. Prikl. Spektrii, 6(2):202-209, Feb. 1967. 19 refs.

Contaminants present in urban atmospheres were investigated by column and thin-layer chromatography and by spectral analysis of quasilinear fluorescence spectra. Nine substances, including three compounds possessing very high carcinogenic activity, were detected in contaminated atmospheres. Polycyclic aromatic hydrocarbon data obtained from the present investigation were compared with earlier data. Structural formulae of the compounds found in the polluted atmosphere are given. Tables give numerical information extrapolated from data obtained by means of fluorescence spectroscopy.

882 APTIC NUMBER 12389

Dodd, A. E. and J. Spiers
SMOKE MEASUREMENT-INSTRUMENTS AND COMPARISON OF METHODS. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution control, London, 1966, 14p. 20 refs. (Nov. 25-26, Paper 14.)

All true smokemeters are devices for measuring the concentration of particulate matter in a gas discharge. Various kinds of smokemeters are described and evaluated, although none is ideal in the actual measurement of diesel smoke. Three basic categories are (1) filter types, using a medium to retain the particulate matter for subsequent measurement by light reflection from the soiled medium; (2) light-absorbent types, in which the degree of interference with direct transmission of light is measured; and (3) light-dispersant types, in which only the degree of reflection

by the suspended particles is measured. In addition, the method of gas extraction from the exhaust systems may be full-flow or sampling type. The measurement may be made continuously or on a discrete volume of gas, and either over a fixed length of smoke column or through the actual smoke plume discharged from the exhaust pipe. Various test techniques are also evaluated in an effort to find a method for control purposes which would rapidly assess the maximum smoke level a vehicle would emit under normal or relatively steady conditions of road usage. The steady-state test itself, while technically the most acceptable, is lengthy and difficult to carry out at a roadside check; controlled accelerations would be best carried out on chassis dynamometers. Of the transient tests considered, the free-acceleration is the easiest to carry out on a vehicle but does not rate vehicles in the correct order of exhaust discoloration.

883 APTIC NUMBER 16885

Edwards, Harry W.
DIRECT MEASUREMENT OF CONTAINED SILVER IODIDE AEROSOL DECAY BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. J. Atmospheric Sci., 26(2): 327-329, March 1969. 6 refs.

Reported in this note is a method for observing directly the concentration of silver iodide in an AgI-aerosol. The method is based on the application of atomic absorption spectrophotometry (AAS) to the direct determination of silver in air. A feature of the analytical method is that AAS is sensitive only to the concentration of silver, and thus the effect of agglomeration, e.g., an increase with time of the average mass per particle, has no effect upon the macroscopic concentration of silver iodide in the air sample. The time-rate-of-change in silver concentration is therefore, a direct measure of the rate of deposition of AgI-aerosol particles upon the container walls. To demonstrate the application of AAS to the measurement of airborne silver in the concentration range typical of certain weather modification activities, the rate of disappearance of silver iodide from AgI-aerosols contained in balloons of three different volumes was measured by AAS. (Author's Abstract)

884 APTIC NUMBER 12338

Ellsworth, Edward
THE FEASIBILITY OF GLASS CULTURE TUBES AS DISPOSABLE CUVETTES IN COLORIMETRIC DETERMINATION OF OZONE AND NITROGEN DIOXIDE. Preprint, Air Pollution Control Association, New York City, 19p., 1969. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, N. Y., June 22-26, 1969.)

Glass culture tubes made of lint or borosilicate glass and measuring 13 by 100 mm were compared with cuvettes recommended for use with the Spectronic 20 Colorimeter. Ozone and nitrogen dioxide were sampled from exposure chambers, and after standard methods of analysis, optical densities were recorded. The ovality of the culture tubes was also compared to that of the cuvette at random rotated positions. The glass culture tubes showed no more variation in repeated optical density readings that did the cuvettes, nor was the culture tube less uniform in shape than the cuvette. Use of the disposable glass culture tubes can make manual ozone and NO2 colorimetric assays more rapid and economical without increasing technical variability. (Author abstract modified)

885 APTIC NUMBER 12316

Eutsler, B. C. and E. E. Campbell
AIR SAMPLING WITH PLASTIC BAGS. Los Alamos Scientific Lab., N. Mex., 9p., 1967 (?). 2 refs.
CFSTI: LADC-9056

Tests on 1/4-mil Mylar plastic bags were performed to investigate their suitability for air sampling with various compounds. Samples were analyzed on either a 10-m infrared cell or by gas chromatography. Results showed that plastic bags can be used for in-plant air sampling and present a sample that can be handled easily in a laboratory for instrumental analysis. Each bag material must be evaluated for the specific application at hand; Mylar is preferred for compounds of interest in industrial hygiene. The use of plastic bags for gaseous air pollutants has a number of advantages. The bags are lightweight and inexpensive to manufacture. Simple, low-vacuum pumping systems may be used to fill them, and no dilution correction is necessary for sample analysis. Breath samples may be collected more easily than by other methods.

886 APTIC NUMBER 17380

Freedman, Robert W., B. A. Coulehan, and H. W. Lang
KINETIC EVALUATION OF THE FACTOR USED IN THE SALTZMAN ANALYSIS OF OXIDES OF NITROGEN. Am. Ind. Hyg. Assoc. J., 31(1):76-80, Feb. 1970. 12 refs.

The Saltzman reaction commonly used for analyzing atmospheric concentrations of nitrogen oxides involves the diazotization of sulfanic acid by nitrous acid, followed by coupling with N (1-naphthyl)-ethylenediamine to yield an azo dye. The raw results are generally divided by a factor of about 0.7 to compensate for the formation of nitric acid. A modification of the reaction is used at the Bureau of Mines to analyze diesel exhaust gas in which concentrations of nitrogen oxides are higher than ambient levels by a factor of 100. The exhaust gases are collected directly from the engine, mainly in the form of nitric oxide, in vacuum bottles. This permits rapid formation of nitrous acid followed by diazotization and coupling long before the gas-phase oxidation of nitric oxide is allowed to proceed to completion. To explain the quantitative yield (factor equals 1.00) obtained with the modified Saltzman method, the overall reaction kinetics were evaluated. The overall reaction consisting of the gas-phase oxidation followed by solution in and with reaction Saltzman's reagent was pseudo-third order. The overall reaction is quantitative as shown by comparison with the phenoldisulfonic acid method. Oxides of nitrogen exist almost exclusively as nitric oxide at engine temperatures, and very rapid sampling directly into the Saltzman reagent provides insufficient time for the nitrogen dioxide to total nitrogen oxides ratio to exceed 0.5. The Saltzman 'factor' decreases linearly with the log of initial concentration. This

was true over the concentration range measured (400 to 2800 ppm) starting with either nitric oxide or nitrogen dioxide.

887 APTIC NUMBER 16621

Galla, Stephen J., Daniel M. Ottenstein, and Salvatore M. Sancetta
ANALYSIS OF NITROUS OXIDE BY GAS CHROMATOGRAPHY IN THE MEASUREMENT OF CEREBRAL AND CORONARY BLOOD FLOW. J. Lab. and Clin. Med., 67(4):678-688, April 1966. 15 refs.

Serious limitations exist in the measurement of cerebral and coronary blood flow in anesthetized subjects by the uptake of nitrous oxide (Kety method). Furthermore, the manometric technique for analysis of nitrous oxide is tedious and time-consuming, requires relatively large amounts of blood, and involves numerous calculations and correction factors. The adaption of gas-liquid chromatography for the analysis of nitrous oxide was described which required the design of a special reaction chamber for extraction of blood gases, chemical removal of oxygen and carbon dioxide, and instantaneous injection into the column system. The chromatographic method was compared simultaneously with the manometric method of Van Slyke. In nine adults, the cerebral blood flow averaged 61 cc/100 g/minute by manometric analysis and 50 cc/100 g/minute by chromatography using the desaturation technique. Three measurements of coronary blood flow gave an average value of 89 cc/100 g/minute which was also in agreement with previous reports. The main advantages of gas chromatography over the manometric methods are the complete separation of nitrous oxide from all other gases in the blood sample, especially inhalational anesthetic agents; the minute quantities of blood required; simplicity of the calculations; and the speed of analysis. (Author abstract modified)

888 APTIC NUMBER 17368

Guiraud, G. and Y. Berlier
QUANTITATIVE AND ISOTOPIC DETERMINATION BY MASS SPECTROMETRY OF GASEOUS COMPOUNDS PRODUCED DURING DENITRIFICATION. (Determination quantitative et isotopique, par spectrometrie de masse, des composes gazeux produits dans la denitirification). Text in French. Chim. Anal. (Paris), 52(1):53-56, Jan. 1970. 8 refs.

Theoretically 'denitrification' is defined as the reduction of nitrates present in the soil to the state of molecular nitrogen. However, in practice, its definition is broader in that it includes the reduction of the nitrates to the gaseous state, except ammonia, by biological or chemical processes. Existing methods of determining the products of denitrification are discussed with respect to their shortcomings. A mass spectrometric method of determining nitrogen and nitrous oxide emitted by the soil in the course of its denitrification is simpler and more rapid than the previous ones. The incubator used in the tests is hermetically sealed and contains a known amount of soil in a pyrex jar which is in contact with an attachment containing a concentrated solution of soda to absorb the CO2 released by the soil. The pyrex jar can be connected by turning a ground cock with a semi-capillary U-shaped tube immersed in liquid nitrogen, in order to trap condensable gases (residual CO2 and particularly N2O). This trap can be shut off by cocks on both sides. In most cases, 20 g of soil saturated with water was used to which 1% of glucose and 15 mg of nitrogen in the form of KNO3 enriched 30% by the 15N isotope was added. The incubators were kept at 25 C in an oven and their atmosphere was periodically analyzed by a Varian Mat model GD 150 mass-spectrometer The isotope content of the gaseous compounds with two N atoms can be measured in three different ways. The quantitative determination of the amounts of N2O and N2 are described and discussed in great detail and a typical example is given.

889 APTIC NUMBER 12263

Hayes, Janet V.
COMPARISON OF THE ROTOSLIDE AND DURHAM SAMPLERS IN A SURVEY OF AIRBORNE POLLEN. Ann. Allergy, vol. 27:575-584, Nov. 1969. 15 refs.

An intermittent rotoslide and two Durham samplers were operated simultaneously for five months in 1962 on top of a 170-ft building. The rotoslide was operated for 2.5 min every half hour. One Durham sampler was oriented with the long axis of the slide in the north-south direction, and the other east-west to eliminate the effect of wind direction on the combined catch of pollen. The rotoslide collected larger quantities of pollen than the Durham samplers and gave data with greater statistical reliability; pollen counts from the rotoslide were often high enough to be significant at the same time that a Durham sampler collected little or no pollen. The rotoslide also catches a greater variety of pollen and detects seasonal patterns of occurrence more successfully than a Durham sampler. As indicated by variations in the daily ratios between the samplers, wind speed and direction and atmospheric turbulence and precipitation affect the samplers differently. There is no factor that can be used to convert data from Durham slides to the concentrations measurable with the intermittent rotoslide. Operational difficulties of the rotoslide sampler are few and easily corrected, while the ordinary microscope slides are conveniently stored and handled. The technique of removing the rotoslide samples from the slide edges provides satisfactory optical qualities for pollen identification.

890 APTIC NUMBER 16857

Healy, Thomas E. and Paul Urone
GAS CHROMATOGRAPHY OF OXIDANTS USING A FLOWING LIQUID COLORIMETRIC DETECTOR. Anal. Chem., 41(13):1777-1780, Nov. 1969. 17 refs.

A flowing liquid colorimetric detector was used for the gas chromatographic determination of hydroperoxides and nitrogen dioxide for possible application in air pollution studies. Half the effluent from the column went to a flame ionization detector, and half to a bubbler, in which the hydroperoxides reacted with a flowing ferrous thiocyanate liquid reagent. The liquid passed through a colorimeter, and the transmittance was recorded automatically. Several stationary phases were studied; the best was polyethylene glycol 400 on Chromosorb G, treated with hydrogen peroxide. The detection limit with the apparatus used was about nine micrograms of hydroperoxide. Nitrogen dioxide eluted from the same stationary phases; but, on most of them the colorimetric detector indicated that only about 1% of the

eluted sample gave the NO2 colorimetric reaction. (Author's Abstract)

891 APTIC NUMBER 11604

Heinz, Winfield B., Naum S. Bers, William Burns, and Lawrence Lewis
HIGHWAY DYNAMICS AND AUTOMOTIVE EMISSION TEST PROCEDURES. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 63-71, Sept. 1968. 8 refs.

Information about the influence of sudden changes in automobile speed on smog formation is being obtained with a portable magnetic recorder equipped to record as many as 32 channels of data on three tracks, while using a fourth track for audio monitoring of tests in progress. In addition to speed, torque, manifold pressure, and throttle position, the instrument also records temperatures, fuel flow, air flow, accelerations, engine rpm, etc. The recorder is suitable for use in tests exploring the total content of engine exhaust stream emissions. It is suggested that future research can evaluate emissions from many different automobiles in a short time by subjecting each to programs of tape recorded speed and torque.

892 APTIC NUMBER 16882

Henderson, J. S.
AMBIENT AIR SAMPLING INSTRUMENTS, PROGRAM COSTS AND APPLICATIONS. Am. Paper Ind., 51(10):13-14, 16, 18, Oct. 1969. 18 refs.

Air sampling management planning information is outlined. The hardware, manpower and expense elements of an air sampling program are discussed. Before embarking on an air sampling program all types of samplers--continuous recording, semi-automatic, and static-type--should be considered. Proper application of the various samplers can result in accurate data at a minimum cost. (Author's Abstract)

893 APTIC NUMBER 11855

Hochheiser, Seymour and Walter F. Ludmann
FIELD COMPARISON OF METHODS OF DETERMINING ATMOSPHERIC NO AND NO2. Preprint, American Chemical Society, Washington, D. C., 17p., 1965. 13 refs. (Presented at the American Chemical Society 150th National Meeting Atlantic City, N. J., Sept. 13, 1965.)

Atmospheric samples from several cities were used in a comparative study of the Saltzman and Jacobs-Hochheiser methods of measuring atmospheric nitrogen dioxide concentrations. Nitric oxide is determined by these methods after wet oxidation of the NO to NO2 in a gas scrubber containing an acid-permanganate reagent. The reproducibility of the two methods for measuring NO and NO2 in 30-min samples was determined by collecting atmospheric samples in duplicate and analyzing the difference in results. For NO2 measurements, the reproducibility of the two methods was about the same; for NO, the reproducibility of the Jacobs-Hochheiser method was better. Reproducibility of both methods was better for NO2 measurements than for NO measurements, indicating perhaps that a permanganate bubbler adds to inherent and systematic errors. There were no appreciable differences in mean concentrations of NO and NO2 measured by either method in any city. The relationship of measurements obtained by both methods for 30-min sampling periods indicates that if the disproportionation factor for the Jacobs-Hochheiser method is considered to be approximately 0.6 to 0.8, the two methods agree at NO2 concentrations greater than 0.05 ppm. Sulfur dioxide or NO at the concentrations encountered did not appear to affect the differences between NO2 measurements obtained by the two methods.

894 APTIC NUMBER 17378

Hwang, Jae Y.
DETERMINATION OF ATMOSPHERIC IRON PARTICULATES BY X-RAY FLUORESCENCE SPECTROSCOPY. Talanta, 17(1):118-121, Jan. 1970. 12 refs.

Atmospheric iron particulates as iron oxides present a serious hazard to human beings. They can be determined with satisfactory precision and accuracy by X-ray fluorescence spectroscopy. Diluted samples of 1000, 300, 100, 30, and 10 micrograms of iron were precipitated as hydrous (III) oxide and the intensities of (FeK(alpha) lines determined. The count-rate was plotted on a log-log scale for amounts between 10 and 1000 micrograms. The recorded peaks of the X-ray fluorescence spectra and the calibration graph are shown. The working curve is linear up to 1000 micrograms of iron as hydrous iron (III), though it is doubtful whether the linearity will hold up to 1000 micrograms in actual atmospheric samples. The precision of the method, while comparing favorably with that of atomic-absorption spectroscopy, could be improved by using a thinner beryllium window in the X-ray chamber. Disadvantages of the method are complications due to inter-element effects and the difficulty in preparing proper standards.

895 APTIC NUMBER 16881

Inaba, Humio, and Takao Kobayasi
LASER-RAMAN RADAR FOR CHEMICAL ANALYSIS OF POLLUTED AIR. Nature, 224(5215):170-172, Oct. 11, 1969. 8 refs.

A laser-Raman radar system which is suitable as an air pollution probe in real time is discussed briefly. The technique is based on measurement of the backscattered energy composed of Rayleigh and Mie scattering components of the frequency, and the Raman shifted frequencies due to various Raman active gases in the atmosphere, which can be detected simultaneously through optical filtering devices with multi-channel sensitive detectors.

896 APTIC NUMBER 12487

Kaimosho, Masayasu
THE PROBLEMS OF ODOR NUISANCE. 3. MEASUREMENT AND EVALUATION OF ODOR BY SENSE OF SMELL. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 2(1):no pagination given, 1967. Translated from

Japanese. 8p.

Environmental factors influencing functional tests of odor perception are considered. A room used for olfactory tests must be able to absorb sound and must be maintained at approximately 25 C. Next in importance is ventilation: a testing facility of about 10 cu m requires a ventiltion fan with a capacity of 30 cu m/min. The room should be constructed from materials, such as stainless steel or plastic board, that adsorb odors. For a room of 10 cu m, an illumination intensity of 40-60 W is satisfactory. The most commonly used method of evaluating an odor is the five-point system in which an odor is assigned to one of the following categories: no odor, faint odor, tolerable odor, tolerable for a short period of time, intolerable. The tendency of an odor panel to underestimate the strength of an odor must be watched.

897 APTIC NUMBER 12488

Kato, Tatsuo
THE PROBLEMS OF ODOR NUISANCE. 5. SAMPLING AND ANALYTICAL PROCEDURES IN GAS CHROMATOGRAPHIC MEASUREMENT. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1);pagination not given, 1967. Translated from Japanese. 9p.

Gas chromatographic techniques for analyzing odorous components of extremely low concentrations of sample gases are reviewed: the low-temperature absorption and concentration process, and the solid reaction tube process. The first method separates the mixed components of a gas by cooling the gas to a low temperature. To collect atmospheric pollutants, liquid oxygen is used. A disavantage of the method is that the carbon dioxide and moisture in the air are condensed and collected at the same time, and an operation to eliminate them is indispensible. Soda lime is generally used as the removel agent for carbon dioxide and granulated potassium carbonate as the dehydrating agent, a procedure that can lead to the loss of a small amount of pollution components. Though the low-temperature process is suited to the clarification of unknown odors, its operation is complicated. Many reactive components of an odorous air sample are better collected by reaction. In a new technique for collecting reacted materials, air is passed through a glass tube packed with glass beads that are lightly coated with a solid reagent. Because liquid is not used, the total amount of decomposed material can be introduced and analyzed in the gas chromatographic apparatus. Collection efficiency is high. A disadvantage of the method is that it does not permit total analysis of a mixture.

898 APTIC NUMBER 18057

Kelley, John J., Jr.
OBSERVATIONS OF CARBON DIOXIDE IN THE ATMOSPHERE OVER THE WESTERN UNITED STATES. J. Geophys. Res., 74(6):1688-1693, March 15, 1969. 8 refs.

Carbon dioxide in the atmosphere has been investigated by means of continuous infrared analysis from an aircraft over the western United States. A 2-ppm difference in CO2 in the air between the west coast and interior areas is noted. The vertical CO2 gradient over the Los Angeles area indicates a source of CO2 at the surface. (Author's Abstract)

899 APTIC NUMBER 11678

Kennedy, E. D. and E. E. Pennell
INDUSTRIAL APPLICATIONS OF THE SEMI-AUTOMATED FLUORINE ANALYZER. Am. Chem. Soc., Div. Water, Air, Waste Chem. Preprints, 7(1):235-236, 1967.

A semi-automated method of fluoride analysis is based on flashing an acidified sample to a fractionating column, sweeping the distilled fluoride and water to a microcondensor, and mixing the condensate with alizarin fluorine blue-lanthanum reagent. The mixture is then passed to a colorimeter which measures absorbance at 624 millimicrons. The impluse received is recorded on a chart indicating optical density. Samples of air and liquid plant effluents are analyzed directly or after proper dilution to the concentration range of 0.40-4.0 micrograms F/ml. Good results are also obtained when the method is used to monitor phosphate products requiring strict control of fluoride levels.

900 APTIC NUMBER 18058

King, H. G. C. and G. Pruden
THE DETERMINATION OF SULPHUR DIOXIDE WITH ROSANILINE DYES. Analyst, 94(1114):43-48, Jan. 1969. 8 refs.

The compositions of commercial rosaniline hydrochloride (magenta) and pararosaniline hydrochloride samples have been re-investigated to improve the colorimetric determination of SO2. The dyes, purified in small amounts by paper chromatography, each give a linear calibration up to 80 micrograms of SO2, with the hydrochloric acid - formaldehyde reaction at pH 1.1. Of the two dyes, pararosaniline hydrochloride is preferred because of its smaller reagent blank value. Impurities can be readily removed from pararosaniline base by recrystallisation, and this reagent is, therefore, recommended for routine work. (Author's Abstract)

901 APTIC NUMBER 12126

Kitagawa, Tetsuzo, Yoshitaka Kobayashi, and Saburo Kanno
RAPID ANALYSIS OF SULFUR DIOXIDE IN FLUE GASES BY MEANS OF DETECTOR TUBES. Preprint, 20p., 1964 (?). 3 refs.

The use of detector tubes is described for rapidly determining the concentration of sulfur dioxide in flue gases from the combustion of coal or oil. The glass detector tube has an inside diameter of about 2 mm and a total length of about 130 mm. A constant amount of white detecting reagent particles is packed into each tube and stopped by cotton plugs. The detecting reagent is made by adding 100 ml of 0.2% potassium iodate solution to 100 g of silica gel particles. The color of the detecting reagent turns from white to orange by liberation of iodine by the reduction of iodate in contact with sulfur dioxide.

Both ends of the tube are hermetically sealed. The total length of the packed gel plug is between 60 and 80 mm, depending on the inside diameter of the tube; the packed weight of detecting reagent in each tube is 0.25 g. The analytical apparatus for the method consists of a precision vacuum pump, the SO2 detector tubes, antecedent tubes, a concentration chart, thermometer, suction pump, and a sampling tube attached to the wall of the flue. Each measurement from sampling to reading takes no more than 5 min. The measurable range of the method is from 0.02-03% SO2.

902

APTIC NUMBER 12123

Korth, Merrill W., Thomas P. McMahon, and John E. Sigsby
CORRECTION FOR HYDROCARBON BACKGROUND IN CONSTANT-VOLUME SAMPLING OF AUTO EXHAUST. Preprint, Air Pollution Control Association, New York City, 9p., 1969. 1 ref. (Presented at the Air Pollution Control Association Annual Meeting, 62nd, New York, June 22-26, 1969.)

In the constant-volume sampling system for automotive exhaust, total collected exhaust from a vehicle is diluted and a small integrated sample from the total dilute sample is extracted for analysis. In principle, the mass of the various pollutants is easily calculated from the volume of the total dilute sample and the concentration of pollutants in the smaller sample. In practice, the accuracy of calculations can be affected by contamination of samples by hydrocarbons in the air used for dilution. Commerical charcoal filters keep the hydrocarbon concentration of the dilution air at a level constant enough to make corrections for background hydrocarbons without complicated instruments or analytical procedures by multiplying the background concentration by a correction factor and subtracting the product from the concentration of the total sample. The effectiveness of a commerical charcoal filter was evaluated with gasoline vapors, automobile exhaust, and bottled pure components; these materials were diluted with air and introduced continuously to a charcoal filter at concentrations comparable to those in automotive exhaust. Hydrocarbons were measured by gas chromatography or flame ionization analyzers. Retention capacity of the filter for C1 to C3 hydrocarbons was low, but the filter was effective in integrating rapidly fluctuating concentrations of these light materials in contaminated dilution air. With C4 to C10 hydrocarbons, removal efficiency was 90%.

903

APTIC NUMBER 12295

Krivoruchko, F. D.
DETERMINATION OF BERYLLIUM IN AIR IN THE PRESENCE OF LARGE AMOUNTS OF IRON, ALUMINUM, COPPER, NICKEL, COBALT AND SILICON. (Opredelenie berilliya v vozdukhe v prisutstvii bol'shogo kolichestva zheleza, alyuminiya, medi, nikelya, kobal'ta i kremniya). Hyg. Sanit., 33(7-9):216-218, July-Sept. 1968. 1 ref.

Individual laboratory procedures for determining 1.5 to 50% beryllium in the presence of 50 to 98.5% iron, aluminum, copper, nickel, cobalt, and silicon, in the aeroscls generated by the machining of beryllium alloys, are reported. These techniques provided a means for the efficient preliminary separation of the listed cations, which in these investigations were present as their sulfates and nitrates; silicon was present as the dioxide.

904

APTIC NUMBER 11948

Kuznetsoff, V. I. and N. N. Basargin
METAL INDICATOR FOR BARIUM IN VOLUMETRIC SULFATE DETERMINATION IN THE PRESENCE OF PHOSPHATES AND ARSENATES. (Metalloindikator na barii pri ob'emnom opredelenii sul'fatov v prisutstvii fosfatov i arsenatov). Zavodsk. Lab. (Moscow), 31(5):538-40, 1965. Translated from Russian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 8p.

A new indicator, Nitchromazo, is used for determining sulfate ions by barium salt titration in the presence of two-fold amounts of arsenate and thirty-fold amounts of phosphate. During titration in a 50% alcohol-water solution, Nitchromazo interacts with barium in an acid range (pH 2.0) producing a contrasting reaction and a sharp color change from a violet to blue. Nitchromazo is synthesized by conjugation of diazotized 4-nitroaniline-2-sulfonic acid with chromotropic acid in the presence of Ca(OH)2. For determining sulfates in the range of 0.04 to 0.4 mg in the presence of arsenates (range 0.16 to 1.6 mg) or phosphates (range 0.2 to 2.0 mg), one drop of 0.2% aqueous solution of Nitchromazo is added, together with 10 to 15 ml of alcohol or acetone to a 10 to 15 ml solution with an acid strength of 0.01 N HCl (pH 2.0). The solution is then titrated with 0.005 -0.01 N BaCl2 until the violet color of the solution changes to blue. With small amounts of sulfate, the titration should be stopped at an intermediate color of the indicator. The molarity of barium is determined by a prior titration with sodium sulfate of sulfuric acid in the presence of an appropriate indicator.

905

APTIC NUMBER 11967

Lantheaume, R.
INDUSTRIAL CONTROL ANALYSIS OF BLAST FURNACE TOP GAS BY GAS CHROMATOGRAPHY. Rev. Met. (Paris), 61(12):1061-1063, 1964. 3 refs. Translated from French. Henry Brutcher, Technical Translations, Altadena, Calif., 8p.

An industrial chromatograph was developed for the analysis of blast furnace top gas the components of which are hydrogen, nitrogen, carbon monoxide, and carbon dioxide. The instrument is constructed in two parts. The first part consists of the measuring head, placed in an anti-deflagrating container and controlled thermostatically to 1/10 C. This unit is located as near as possible to the sample point. It includes the cell, cocks, and columns in the upper section, and the electro-valves for controlling the cocks and the carrier gas supply regulator for the lower part. The second section is the electronic unit (supply and programming). It includes the stabilized supply for the measuring bridge, controls for temperature regulation and auxiliary components, and the programmer and sensitivity indicators. In the first unit, a column of silica gel is connected in series with a column of 13x molecular sieves. The sample volume is introduced at the top of the column of silica gel. Hydrogen, nitrogen, and carbon monoxide are separated in the sieve column. After eluting the CO2, the system is switched to eliminate the sieve column from the circuit, and the CO2 is removed. About five minutes are

required for analysis of the gas mixture.

906 APTIC NUMBER 12367

Lashock, J. J.
ELECTRONIC DESIGN AND CONSTRUCTION OF A NOBLE GAS ATMOSPHERIC TRACER SYSTEM. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II. Physical Sciences, Part 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 54-57, Oct. 1968. 1 ref.
CFSTI: BNWL-715

The design and construction is described of electronic components for an atmospheric tracer program requiring the emission of radioactive gases for the determination of various wind transport and diffusion parameters. The overall tracer detection system consists of 63 field detectors from which counting information is relayed to a central data collection center. The radiation detectors are large-window, halogen-quenched counters with a high sensitivity for beta particles. A special preamplifier assembled in a solid-state electronics systems facilities transmission of the Geiger signals over long cable distances. At the data collection center, input signals are accommodated by two discriminator chassis. Integrated into each discriminator circuit is a high-voltage filter network that decouples incoming signals from the high voltage supply. The discriminator positions are uniquely encoded by a programmer so that their respective positions (field locations) are identified in a computer memory by a 6 bit binary code. The automatic data collection system should make possible measurements of short-term wind fluctuations and the downwind behavior of a tracer with time.

907 APTIC NUMBER 12390

Lawrence, G. L. and R. J. Firth
FACTORS IN THE DESIGN OF AUTOMATIC FLOW BENCHES FOR CARBURETOR INSPECTION. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 11p. (Nov. 25-26, Paper 15.)

Automated flow bench equipment is described for the production control of carburetor metering standards, with particular reference to exhaust emission control programs; problems of design and development are also discussed. The comparative flow test principle was used in designing the system, with built-in safeguards against 'drift' due to ambient variation. Air valve carburetors of the single jet type made it possibe to test at full throttle opening, thus permitting the use of downstream sonic metering orifices. Air flow is metered in turn by means of the selected sonic orifice from a group of four arranged to span the functional range of the carburetor, and the pressure drop across the orifice is maintained at a level guaranteed to exceed the condition at which critical flow is established. To check correct function of the downstream air metering device, a conventional upstream system is provided, measuring pressure drop across thin plate orifices with a slant manometer. Fuel is metered through a calibrated pipette with semi-conductor photocells defining the volume and instructing the timing apparatus. The complete cycle of flow testing is controlled by an electrosequential logic system. The flow benches may be equipped so that results may be directed to a digital read-out system to provide data for quality contol and production 'trending,' and all these principles were used in the design of a multiple-station flow bench capable of checking six carburetors simultaneously.

908 APTIC NUMBER 17352

Levin, Harry
NOTE ON A SLURRY METHOD OF PARTICLE INDUCTION. J. Air Pollution Control Assoc., 20(3):178-179, March 1970.

As part of a program concerned with the incineration of solid waste to produce megawatt electric power, an alumina slurry method of inducting test particles into a high-temperature, high-pressure gaseous flow stream was developed. The slurry is prepared by adding alumina to gelled methanol and blending the mixture for several hours in a vibroenergy mill. This processing causes an effective dispersion of alumina particles. Comminution of particles is minimal because of the high velocity of the slurry and the comparable hardness of particles and milling medium. On demand and at prescribed flow rate, the slurry is delivered through metal tubing to the burner. Delivery is accomplished by a controlled and metered flow of methanol into the slurry cylinder above the piston and under pressure of nitrogen. Within the burner, the slurry is atomized, prior to injection, by injection into and impingement with methanol streams. This method of test particle induction provides improved particle statistics through stable homogenization of particles in blending and removal of angularities from particles of interest in particle size distribution analyses. The method converts poor collections of particulate materials into highly useful test dusts.

909 APTIC NUMBER 18059

Lindeken, C. L. and D. H. Denham
DETECTION OF PLUTONIUM ON AIR FILTERS USING THE ALPHA/BETA RATIO OF RESIDUAL THORON DAUGHTER ACTIVITY. Health Phys., 16(2): 235-238, Feb. 1969. 7 refs.

The relative constancy of the ratio between the alpha and beta activities of natural airborne radioactivity and the increase in this ratio when long-lived alpha activity is present in the air being sampled has been repeatedly suggested for detection of airborne plutonium. Based on a year long pilot study, the data indicate that the alpha/beta ratio of thoron daughter activity on a sample filter can be used to detect 239Pu at airborne concentrations less than 1 MPC. This sensitivity is based on 8 hr of sampling, followed by a 6 hr decay period before counting and assumes that the thoron daughter concentration in the air being sampled is not greater than 15 pCi/m cu m. This means that air monitoring data for the previous day is available before the next day's operation begins so that any 239Pu release can be reported and investigated before resumption of work.

910 APTIC NUMBER 11769

Liu, Benjamin Y. H. and Avtar C. Verma
A PULSE-CHARGING-PULSE-PRECIPITATING ELECTROSTATIC AEROSOL SAMPLER. (SECTION II). Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering, AEC Contract AT(11-1)-1248, Pub. COO-1248-11, 23p., Aug. 1967. 15 refs.

A two-stage electrostatic aerosol sampler based upon the pulse-charging-pulse precipitating principle is described. The sampler is capable of collecting a uniform aerosol deposit over a 3 cm by 5 cm area. Aerosol samples can be collected directly on glass microscope slides and cover slips, electron microscope grids coated with Formvar, carbon, and other films, and any other flat electrically conducting or non-conducting surface. The sampling efficiency and uniformity of the aerosol deposit were determined by means of monodisperse fluorescent aerosol of uranine ranging in size from 0.016 micron to 6.3 micron. The efficiency varies by approximately 10% over a two-decade range in particle size; over the entire range of particle size tested, the variation was from approximately 54% to 81%. The sampler is particularly suitable for collecting aerosol samples for the determination of the absolute concentration and size distribution of aerosols by light and electron microscopy. (Author abstract modified)

911 APTIC NUMBER 16864

Livesey, P. J. and P. W. Billmeyer, Jr.
PARTICLE-SIZE DETERMINATION BY LOW-ANGLE LIGHT SCATTERING: NEW INSTRUMENTATION AND A RAPID METHOD OF INTERPRETING DATA. J. Colloid Interface Sci., 30(4):447-472, Aug. 1969. 44 refs.

New instrumentation is available for measuring the intensity of light scattered from a system down to very small angles, allowing the light-scattering technique to be extended to the evaluation of particle sizes in the range 0.2-100 microns. A rapid method deduced by Sloan and Arrington for interpreting the scattering data, using graphical approximations to the Mie theory, is reviewed. Results are independent within fairly wide limits of the size and concentration of the disperse phase and of the relative refractive index. Thus measurements are valid even when the suspended phase cannot readily be resolved by the optical microscope, either because of insufficient refractive index differential or because of motion within the system. This combination of instrument and interpretation of results is particularly useful not only in the study of normal particle suspensions but also in the comparison of biological and inert systems with respect to size distribution and type and length of applied treatment, the characterization of inhomogeneities in gel systems, the effect of particle size on the optical clarity of films, and the study of such processes as precipitation, aerosol formation, emulsification, mixing, grinding, dispersion, and sedimentation. (Author's Abstract)

912 APTIC NUMBER 12132

Lodge, James P., Jr.
DETERMINATION OF NITROGEN OXIDES. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnatic, Ohio, Lab of Engineering and Physical Sciences, 4p., 1960. 3 refs.

The Saltzman and Jacobs techniques for field determinations of nitrogen oxides are compared. The Public Health Service study of automotive exhaust uses the Saltzman reagent for both nitrogen dioxide and nitric oxide. The latter is oxidized by passage through 2.5% potassium permanganate in 2.5 (v/v) % aqueous sulfuric acid. The Saltzman reagent will keep for some months in a dark, refrigerated bottle. It will, however, last only a few days in light at room temperature. It has a substantial temperature coefficient for color development; for accurate work, it must be used at room temperature, and always measured the same length of time after sampling. Because of the reagent's lability and the developed color, the National Air Sampling Network uses the Jacobs procedure. They sample for 24-hours into alkali, then ship the sample to a central laboratory for analysis. The delay in analysis may be as great as three weeks, but replicate samples always agree closely. Though no studies are known of nitric oxide determination by this method, there is no reason why it could not be used in a manner analogous to the Saltzman method. The choice between the two methods appears to be entirely that of convenience in the particular application.

913 APTIC NUMBER 12217

Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Fission Product Inhalation Program
ANALYSIS OF CASCADE IMPACTOR DATA BY A WEIGHTED LEAST SQUARES METHOD. In: Annual Report of the Fission Product Inhalation Program. AEC Contract AT(29-2)-1013, p. 165-171, Nov. 1968. 6 refs.
CFSTI: LF-39

The aerodynamic size distribution of various radioactive aerosols were routinely characterized with a seven-stage round-jet cascade impactor. The impactor was designed to be operated at low volumetric flow rates (50-150 cu cm/min) for short sampling periods of 1-2 min. A rigorous mathematical technique was developed to fit a log-normal function to the activity distribution of aerosols with impactor data. This method employs the efficiency characteristics of each impactor stage for each particle size to fit the impactor data by a weighted least-squares regression analysis with the weight of each datum equal to the inverse of its estimated variance. Estimates of the confidence limits of the fitted parameters were also made. The results of using this technique to characterize 50 actual samples were compared with those obtained from graphical and the 'effective cut-off diameter' methods. The results indicated that the use of the effective cut-off diameters to approximate the efficiencies of the impactor stages is satisfactory for the seven-stage round jet cascade impactor. The use of log-probability paper was observed to be undesirable if errors frequently larger than 10% cannot be tolerated. The stage-efficiencies least-squares method can be employed with any cascade impactor to prevent errors that may arise from using the effective cut-off diameter approximation. It may be used to fit any explicit mathematical function to the cascade impactor. (Author abstract modified)

914 APTIC NUMBER 10437

Ludwick, J. D., J. J. Lashock, R. E. Connally, and R. W. Nickola
AUTOMATIC REAL TIME AIR MONITORING OF 85KR UTILIZING THE 4096 MEMORY OF A MULTIPARAMETER ANALYZER. Rev. Sci. Instr., 39(6):853-859, June 1968. 3 refs.

A noble gas atmospheric monitoring field grid system in which 85Kr is used as a tracer for studying atmospheric transport and diffusion is described. This system is useful in the quantitative measurement of the transport and diffusion of both continuous and true puff-type radioactive gas releases on a real-time basis. Small fluctuations in the air concentrations of the tracer are determined by using integrating times of as little as 1 sec. The system consists of a large group of field detectors which relay their information to a 4096 address memory. The memory is presently programmed to accept information from 64 detectors. Information is accumulated in groups of 64 time channels and these groups are automatically stepped by the programmer. A time interval selector allows automatic advance of the stepping process at a slow or fast rate allowing the desired differential data accumulation. The memory is read out on magnetic tape and the equipment is ready for the next field test 35 sec after completion of a tracer field test. Advantages of the system thus include real time tracer detection, rather long distance data relay, real time information discrimination, accumulative field data display, and rapid instrumental recovering for consecutive atmospheric diffusion tests, in addition to a marked savings in time and crew size needed for field tests. (Author abstract modified)

915 APTIC NUMBER 12368

Ludwick, J. D.
POLAROGRAPHIC TECHNIQUES APPLIED TO PROSPECTIVE ATMOSPHERIC PARTICULATE TRACERS. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. 2: Physical Sciences, Part 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 63-68, Oct. 1968.
CFSTI: BNWL-715

Among particulate elements easily measured by polarography are cadmium , zinc, and antimony, all of which have insoluble compounds suitable for use as tracers. The most sensitive polargraphic method is the anodic stripping technique in which the material is first cathodically reduced and concentrated as an amalgam in a mercury surface or drop. The material is then stripped from the mercury by reversing the potential, and the amount of material present determined from the current produced. Samples thought to contain greater than 1.6 times 10 to the seventh power g of cadmium can be successfully analyzed by more rapid pulse polarographic method. Both methods are highly specific and permit measurements of materials in the presence of large concentrations of other ions, such as sodium, potassium, and calcium.

916 APTIC NUMBER 17348

Lukovskaya, N. M. and L. V. Markova
DETERMINATION OF MICRO AMOUNTS OF SULPHIDE SULFUR BY QUENCHING THE CHEMILUMINESCENCE OF LUMINOL WITH IODINE. (Opredeleniye mikrokolichestv sul 'fidnoy sery po tusheniyu khemilyuminestsentsii lyuminola s iodom). Text in Russian. Zh. Analit. Khim. (Moscow), 24(12):1862-1867, Dec. 1969. 7 refs.

The inhibiting effect of a number of organic and inorganic sulfides on the chemiluminescence of luminol with iodine in an alkaline medium was studied. The product of incomplete oxidation of the sulfide by the hypoiodite proved to be the inhibiting agent, and inhibiting action was eliminated upon complete oxidation of the sulfite to sulfate. Only the chemiluminescent reaction was affected by the inhibitor and not the so-called dark reaction between luminol and iodine. Chemiluminescence quenching is linked with the breaking of chains. It is proposed that this effect be utilized to detect sodium sulfide (hydrogen sulfide and cysteine) photometrically. Sensitivity for sulfide sulfur is 5 times 10 to the minus 9th g with an accuracy of 2 times 10 to the minus 8th; for cysteine sulfur, it is 1 times 10 to the minus 8th g with an accuracy of 5 times 10 to the minus 9th g.

917 APTIC NUMBER 18060

Malinovski, A. and D. Yordanov
A METHOD FOR DYNAMIC DETERMINATION OF THE DEW (OR FROST) POINT AND ITS APPLICATION TO RADIOSONDE HUMIDITY MEASUREMENT. J. Sci. Instr. (J. Phys. E) Ser. 2, 2(3):263-268, March 1969. 8 refs.

A method is described for the dynamic determination of the dew (or frost) point, based on the following principle: A miniature thermometer is cooled for a short time well below the dew point and is subsequently allowed to equilibrate with the ambient temperature. [illegible]y suitably displaying the equilibration curves obtained both in the presence of condensation and in its absence the dew (or frost) point may be quickly and easily derived. This dynamic method makes possible the determination of the dew point when the temperature of the 'mirror' varies, thus avoiding the necessity for heavy and expensive systems to maintain the mirror at the dew point temperature as well as to control the condensate thickness. The dew point is determined here at the temperature at which a dynamic equilibrium is established between the atmospheric water vapor and the water (or ice) on the surface of the thermometer. The dew (or frost) point determined by this method does not depend on the imperfections of the cooling surface. A feature of the instrument is that it is light and convenient for research flights. (Author's Abstract)

918 APTIC NUMBER 16875

McCaldin, R. O., L. W. Johnson, and W. T. Stephens
ATMOSPHERIC AEROSOLS. Science, 166(3703):381-382, Oct. 17, 1969. 3 refs.

Measurements of particle counts and size distributions of atmospheric aerosols have been made of various locations by use of an instrumented aircraft. The number of atmospheric particulates is related to the visibility. (Author's Abstract)

919 APTIC NUMBER 18012

McCaldin, Roy O. and Louis W. Johnson
THE USE OF AIRCRAFT IN AIR POLLUTION RESEARCH. J. Air Pollution Control Assoc., 19(6):405-409, June 1969. 9 refs.

An instrumented single engine aircraft is being used to characterize plumes from large emission sources. The character and concentration of pollution as it ages and travels downwind under known meteorological conditions is being studied through the use of cross sections of the plumes at a number of points. This paper reports experimental work thus far completed on aerosol measurement. Flights have been made through plumes from a large coal-fired power station, forest fires, and a gravel plant. Particle counts in various size classifications were made with a Bausch and Lomb 40-1 Dust Counter which was carried in the aircraft. Selected meteorological parameters were recorded. Results show the aerosol concentrations in various size classifications that are found at successive distances downwind from these sources for distances up to 32 miles. Background aerosol concentrations are also reported, and variations in these can be noted with respect to time, location and altitude. (Author's Abstract)

920 APTIC NUMBER 17400

Miyagisa, Kunio
MEASUREMENT OF SULFUR OXIDES IN FLUE GAS I-2. METHODS OF GAS SAMPLING. (Haigasuchu no iosankabutsu sokuteihc I-2 Shiryo gas saishu hoho). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 22(2):10-13, Feb. 28, 1970.

The neutralization and iodimetric methods included in the measurement of total sulfur oxides of the Japanese Industrial Standards are described. Hydrogen peroxide solution of three percent concentration is used as the absorbing liquid. The waste gas ensuing from combustion is generally led from a combustion chamber to a chimney through the flue. For the purpose of waste gas analysis, the gas sample should be taken from the flue or the chimney. For sampling, a tube is inserted in a hole in the flue provided for this purpose and the gas is led to the absorption bottle. The sampling tube and the entrance of the absorption bottle are heated to prevent condensation of sulfuric anhydride and moisture in the sampled gas and to keep the temperature above the dew point of sulfuric anhydride. The gas is sucked in at a rate of 1 l/min and at a temperature of about 200 C. Twenty liters of the sampled gas are dissolved in the absorption liquid of exactly 250 ml.

921 APTIC NUMBER 12359

Moulton, David G.
TELEMETERING OF SPIKE ACTIVITY DURING BEHAVIORAL RESPONSE TO ODORANTS. North Atlantic Treaty Organization, Paris, Proc. NATO Summer School, Theories Odors Odor Measurement, Istanbul, Turkey, 1968, p. 489-491. 6 refs.
CFSTI DDC: AD 680057

One approach to understanding neural mechanisms involved in odor detection and discrimination is to examine the spike discharge from the olfactory bulb of an animal. This can be achieved by combining the use of implanted electrodes and telemetering devices with the mass automatic training of rats. An air-dilution olfactometer is described that allows such training. The facility is essentially in two parts: a circular training apparatus and an odor choice tunnel. The first is built around a rotating monodrum which supports two water bottles whose metal nozzles project between its base and the floor of the cage. A current shocking device, connected to each nozzle, can be adjusted to produce a shock sufficient to deter a rat from drinking. Since the drum rotates, the animal cannot select a shock-free nozzle on the basis of its position and is forced to use odor cues. After three nights in the apparatus, training is completed in the odor choice tunnel where odorant and air streams are interchanged. The training technique is similar to that involved in the automatic mass-training apparatus. Olfactory spike activity is telemetered from the olfactory bulb of a trained rat being tested in the odor choice tunnel.

922 APTIC NUMBER 12196

Mueller, James I.
OZONESONDE, BUBBLER TYPE. (FINAL REPORT). Mast Development Co., Davenport, Iowa, Contract AFSC-F19628-68-C-C092, Proj. 8628, Task 862807, Unit 86280701, AFCRL-68-0409, 25p., July 31, 1968.
CFSTI DDC: AD 676780

A balloon-borne ozonesonde is described that measures ozone concentrations by means of an electrochemical reaction in a bubbler cell and transmits information to the ground by AN/ART/4B, AN/ART-12, or ESSA radiosondes. Test and flight experience indicate that all components of the ozonesonde are adequate to accomplish the required task without any modification of the radiosondes. A switching device provides a continuing cycle of three seconds of ozone data and seven seconds of meteorological data. At two and one-half minute intervals, the switch selects alternately between air pump temperature data and a calibration function. Sources of error are the destruction of ozone in the instrument before it can react in the bubbler; interference by oxidizing agents other than ozone and by reducing agents in tropospheric and surface air; and varying efficiency of the gas-liquid interaction with altitude. With careful handling, instrument destruction is five percent or less. Temperature effects can introduce a plus or minus three percent error. The bias cell voltage will decrease 25 mb during a flight, resulting in a maximum plus two percent error. The overall calibration factor determined by comparison of integrated flight profiles and spectrophotometer total ozone is 1.2 plus or minus 10%. (Author abstract modified)

923 APTIC NUMBER 11999

Mulac, J. C., Jr.
FLAME IONIZATION HYDROCARBON ANALYZER. In: Report on CRC Symposium on Exhaust Gas Analysis. Coordinating Research Council, Inc., New York, N. Y., CRC-AB-404, p. 22-26, 1965.

The use of a flame ionization analyzer for continuous analysis

of hydrocarbons is described. In this system, the analyzer is an integral part of the exhaust gas analysis instrumentation, in conjunction with the nondispersive infrared hydrocarbon analyzer. To carry out this technique the rate of response by the two instruments to changes in hydrocarbon concentration should be comparable. Response characteristics using propane at 6 cfh flow rate, exhaust gas at the same rate, and exhaust gas at 10 cfh are given. Comparable response characteristics can be achieved for the two analyzers; with knowledge of the oxygen effect on the response of a given flame detector system, relatively accurate results on the amount of total unburned carbon can be obtained without regard to fuel type.

924 APTIC NUMBER 17412

Nakamura, Keigo
METHODS OF MEASURING SO2 IN AIR. 1. LEAD PEROXIDE METHOD. (Taikichu no SO2 sokuteiho. 1. Nisanka namari ho). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 22(2):51-54, Feb. 28, 1970. 6 refs.

The lead perioxide method was originally developed to survey the damage to structures or materials caused by sulfur dioxide gas. Now it is used to monitor atmospheric sulfur dioxide concentrations. A cylindrical biscuit with lead peroxide coated cloth on it is left in a shelter for a month in the air. Sulfur oxides are gathered as lead sulfate, the sulfate ion of which is determined by gravimetric or colorimetric methods to give the integrating concentration of sulfur oxides, which is indicated by mg/day/100 sq cm PbO2. The lead peroxide cylinder is kept dry by placing it 1.5 m above the ground. In extremely polluted areas, large amounts of barium sulfate sediment can interfere with the sulfur dioxide analysis. It is necessary to control the amount of barium sulfate sediment (less than 300 mg). The titration of barium sulfate with methyl orange indicater is operated on the cool sample solution to obtain accurate pH values. Seventeen percent of barium chloride causes maximum amounts of barium sulfate sediment. Boiling the sample solution after the addition of barium chloride and leaving it for 12 hours makes the sediment particles large and pure. Use of a glass filter (1G4) is convenient, since it does not cause reduction by carbon like a paper filter. The activity of lead peroxide influences the measured values of sulfur dioxide; the use of lead peroxide of a definite quality is indicated. Various shelters for lead peroxide are illustrated and the proper coefficient for them is given.

925 APTIC NUMBER 17415

Nakamura, Keigo
METHODS OF MEASURING SO2 IN AIR. 5. CONTINUOUS MONITORING BY AUTO ANALYZER. (Taikichu no SO2 sokuteiho. 5. Oto Anaraiza ni yoru renzoku sokuteiho). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 22(2):69-72, Feb. 28, 1970. 5 refs.

Continuous measurement of air pollution by an auto analyzer (AA) is reviewed. In Japan, little use of this system of automated absorptiometric analysis, has been made in air pollution studies, although it has been used for that purpose in the U. S. since 1962. The standard AA comprises of trial bottles, an autosampler, a fixed quantity pump, a dialyzer, a heater, a continuous photoelectric photometer, a recorder, and plastic or glass tubes to connect the components. Sulfur dioxide is selectively determined by West-Gaeke's method, but Welch's method (improved for AA) is used by NASN in the U.S.A. In this method, sulfur dioxide in an air sample is absorbed by a solution of 0.1 M sodium mercuric tetrachloride as a stable complex salt, after the sample is contacted with formic acid. Prosaniline solution is added for reaction. When passed through a thermostat at 37.5 C, the solution forms a color, and absorbance is measured colorimetrically to the wave length 560. Continuous measurement of sulfur dioxide in air was studied with an AA. The absorbing column was 30 cm in length and packed with glass beads. The absorbing solution (0.1 M sodium mercuric tetrachloride) was pumped to the column at 2 ml/min. Because of the glass beads, the contact between the air sample and the absorbing solution was complete. The efficiency of absorbing column was 96 to approximately 98%; the response time was about 20 min. Zero drift was 2% of full scale after a week, and the sensitivity of the detector was 0.005 ppm (maximum). An example of the SO2 levels recorded by the analyzer is presented to show the fluctuations in values cuased by atmospheric disorders. The analyzer will simultaneously analyze several samples for SO2.

926 APTIC NUMBER 12240

Nelson, G. O.
THE EFFECT OF HALOGEN COMPOUNDS ON THE MOLECULAR SPECTRA OF AIR. In: Hazards Control Progress Report No. 32 (September-December 1968) and Index to Hazards Control Progress Reports Nos. 30 through 32. California Univ., Livermore, Lawrence Radiation Lab., p. 38-46, 1969.
CFSTI: TID-4500

Nitrogen and nitric oxide spectra produced in an ac spark were enhanced by the presence of halogenated materials in air. This phenomenon was observed, irregardless of the concentration or species of halogenated hydrocarbons present in the chamber. The intensity change at a given concentration was greatest for chlorinated materials and decreased progressively for brominated, iodinated, and fluorinated compounds. Spectral intensity also increased with an increase in the number of halogens present on the molecule at a given concentration. The intensity increase for the halogenated materials was not altered significantly by the hydrocarbon side-chain length, configuration, or degree of saturation. The mechanism of interaction between the halogen and nitrogen probably involves collisional processes with the nitrogen after electron attachment to the halogen. Excited N2 and NO subsequently give up energy as photons. This process makes possible selective halogen detection and estimation in the low-ppm range.

927 APTIC NUMBER 18061

Newman, Richard H., William L. Jones, and Robert W. Jenkins, Jr. AUTOMATIC DEVICE FOR THE EVALUATION OF TOTAL MAINSTREAM CIGARETTE SMOKE. Anal. Chem., 41(3):543-545, March 1969.

A technique is described that makes possible the analysis of total mainstream smoke from a cigarette. Heretofore all smoke analyses separated the smoke into gas and total particulate matter. The method described in detail uses a smoking device in conjunction with a cryogenic gas chromatograph. The total mainstream smoke is cooled to -190 degrees C in less than one second between its exit from the cigarette and its collection. It is then slowly eluted directly onto a gas chromatographic column by gradually increasing the temperature of the oven. The components in the smoke are then eluted onto the gas chromatographic column as a function of their boiling points. Normal gas chromatographic techniques are used for the remainder of the analysis.

928 APTIC NUMBER 11605

Nottage, H. B. and I. V. Bertak
INTERACTION OF GASEOUS ATMOSPHERIC POLLUTANTS AND LIVING ENVIRONMENT SURFACES. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 75-77, Sept. 1968.

The procedure and goals of a program for the quantitiative description of interactions between living environment surfaces and air pollutants are summarized. Attention is focused on the problem encountered in obtaining funds for dynamic-response chromatography equipment. Such equipment is capable of automatically analyzing gas compositions in multicomponent mixtures at levels of 0.003-000006 ppm.

929 APTIC NUMBER 12601

Ortman, Gordon C.
A PHOTOMETRIC PRESSURE SENSOR. Preprint, Air Pollution Control Association, New York City, 10p., 1961. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 54th, New York, June 11, 1961.)

The development of a photometric pressure sensor was discussed, including the principle of operation, prototype construction, calibration and performance data, and specific applications. The sensor consists of a capsular element for direct sensing of pressure changes and a photometer in which an electrical signal output varies as a function of a light beam. Frictionless movement of the capsular element was used to intercept more or less of the light beam in the optical path of the photometer which is comprised of a miniature light source, a photo-detector, and a power source. The sensor is sensitive to pressure changes of as little as 0.001 inch of water, and its range and sensitivity can be conveniently adjusted electrically to accomodate a wide range of values. The output signal was measured by indicating meters and/or recorded as current or voltage. The total package can be small and weigh less than half a pound. The instrument is versatile and with minor design modification, can be applied to altitude measurements in feet, barometric readings in millibars, differential pressure changes in inches of water, and topographical measurements over terrain while driving a car. (Author abstract modified)

930 APTIC NUMBER 17351

Osherovich, A. L., M. Ya. Rozinskiy, and Sh. A. Furman
A COMPARISON BETWEEN THE M-83 STANDARD OZONOMETER AND AN OZONOMETER EQUIPPED WITH NARROW-BAND INTERFERENCE FILTERS. Bull. Acad. Sci. USSR, Phys, Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 5(10):593-596, Oct. 1969. 8 refs.

Soviet ozonometer stations are presently equipped with M-83 photoelectric filter ozonometers. These instruments have light filters consisting of colored glasses with wide passbands. When their performance was compared with that of ozonometers having narrow interference filters constructed of alternate layers of lead fluoride and cryolite, the M-83 instruments showed spurious daily ozone variations. One some days, the daily average total ozone content as read from the M-83 differed from that obtained with the other instruments by a factor of nearly two. Because of the large solid angle of the M-83 receiver, total recorded ozone content was too low. Consideration should be given to equipping the Soviet ozonometer network with new and more accurate instruments.

931 APTIC NUMBER 12509

Palmer, H. F., C. J. Nelson, and C. E. Rodes
PERFORMANCE CHARACTERISTICS OF INSTRUMENTAL METHODS FOR MONITORING SULFUR DIOXIDE. PART II: FIELD EVALUATION. Preprint, Air Pollution Control Association, New York City, 33p., 1969. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 23-26, 1969, Paper APCA 69-89.)

Data were obtained on field performance characteristics of sulfur dioxide monitors. These characteristics included weekly calibration drift, comparability of data among the instruments over a period of time, maintenance requirements which included operating cost, unattended operation performance, and the effect of rotameter changes on calibration. Mean weekly calibration drift ranged from 0.00-0.14 ppm over three SO3 input levels, while estimated standard deviations ranged from 0.01-0.29 ppm. A statistical analysis of the comparability of instrument data consisting of an analysis of instrument variance and correlation between instruments was performed. This analysis detected significant differences between instrument variances and exhibited a maximum correlation coefficient of 0.96 and minimum of 0.40. The investigation of maintenance requirements showed that instrument downtime constituted from 0.0-30.3% of the total operating time while the total estimated monthly cost of reagents, electrical power, and chart paper ranged from $6.00-$21.00. Instruments ran unattended for a maximum of 8 days and a minimum of 1 day in an 8-day investigation of unattended operation performance. Non-linearities in the relationship between sample flow and instrument output were observed in a determination of the effect of rotameter changes. It was hoped that the study would lead to further studies of other automatic air analyzers. (Author summary modified)

932 APTIC NUMBER 18013

Papa, Louis J.
COLORIMETRIC DETERMINATION OF CARBONYL COMPOUNDS IN AUTOMOTIVE EXHAUST AS 2,4-DINITROPHENYLHYDRAZONES. Environ. Sci. Technol., 3(4):397-398, April 1969. 11 refs.

A colorimetric technique was developed for determining the total molar concentration of carbonyls in a mixture of their 2,4-dinitrophenylhydrazones (DNPH). The method is based on the measurement of the colored species formed when alkali is added to a solution of the DNPH's in a 70% pyridine medium which stabilizes the colored product. The method is applied to the analysis of carbonyls in vapor mixtures and automotive exhaust via collection of the DNPH derivatives in scrubbers. The recovery of the carbonyls by this technique is 98 to 106% and the reproducibility is plus or minus 3% relative. (Author's Abstract)

933 APTIC NUMBER 11973

Polyanskii, G. A., V. I. Govorov, and P. G. Kalinichenko
AUTOMATIC DETERMINATION OF THE CARBON DIOXIDE CONTENT IN THE GAS ALONG A BLAST FURNACE THROAT RADIUS. Metallurg., 11(6):17-20, 1966. Translated from Russian. Henry Brutcher, Technical Translations, Altadena, Calif., 8p., 1966.

Introducing the gas-sampling tube below the furnace stockline level is widely used for automatically monitoring the gas distribution (for carbon dioxide determination) along the throat radius of a blast furnace. The mechanized and automated installations developed for this purpose have a number of shortcomings: no effective system exists for clearing the line and filter of flue dust, and the reliability of contact units is impaired under the very dusty and corrosive atmospheric conditions. An arrangement is described that overcomes these deficiencies. A water-cooled port is built into the furnace lining. Details on the port ensure automatic tightening of the principle bushing for dependable sealing. Guide rollers are spaced evenly along the length of the sampling route to prevent bending of the probe during its movement in the furnace and to align it when it emerges from the furnace. A rack-and-pinion pusher facilitates tube movement, while contactless positon-sensors produce pulses for stopping the movement at the required points. Performance figures on taking and storing gas samples are given for a prototype unit.

934 APTIC NUMBER 11977

Polydorova, Marie
AUTOMATIC REGISTRATION APPARATUS FOR MEASURING AEROSOL CONCENTRATIONS. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Litlice House of Scientific Workers, 1965, p. 36-42.

An automatic apparatus is described that measures and registers the time distribution of atmospheric aerosols in concentrations from 0.2 to 50 mg/cu m. The apparatus is based on the principle of ultrafiltration and photometric evaluation of the absorbed sample. Aerosol particles are absorbed on the surface of a membrane filter in the form of a 50 mm-wide band that moves at rates of 6 or 18 cm/hr. The amount of dust or smoke particles on the filter is determined by measuring light absorption. The apparatus provides a record of the time distributions of aerosol concentrations in 8-24 hrs and maintains the sample absorbed within the given time area for further evaluation, especially microscopic determinations of dispersity, sulfur dioxide, etc. It also provides a means of continually following changes in aerosol concentrations.

935 APTIC NUMBER 12103

Public Health Service, Cincinnati, Ohio, Robert A. Taft Sanitary Engineering Center
PROCEDURES FOR THE ANALYSIS OF SUSPENDED PARTICULATE MATTER COLLECTED ON GLASS FIBER FILTERS. 15p., 1963.

Step-by-step directions are given for the determination of metals (spectrographic method) non-metals (sulfates, nitrates), and gross beta-radioactivity in particulate matter collected on glass fiber filters. The method for extracting organic materials is also given, including examination by infrared spectroscopy of the extracted crude organic matter, and separation of this crude, benzene-soluble organic material into water-soluble, basic, weakly acidic, strongly acidic, neutral, and water-ether insoluble fractions. Collection and preparation of samples for analysis are described.

936 APTIC NUMBER 17347

Savvin, S. B., T. G. Akimova, V. P. Dedkova, and G. M. Varshal
DETERMINATION OF SULPHATE IONS IN NATURAL WATERS AND ATMOSPHERIC PRECIPITATION. (Opredeleniye sul'fat-ionov v prirodnykh vodakh i atmosfernykh osadkakha). Text in Russian. Zh. Analit Khim. (Moscow), 24(12):1868-1870, Dec. 1969. 10 refs.

A titrimetric method for determining sulfate ion in natural water and atmospheric precipitation, which utilizes an indicator for barium ion called orthanilic K, was developed. This method was demonstrated with samples containing 1.5 micrograms/ml sulfate ion. Analysis of 1-20 samples, including column purification, takes 15-60 min, depending upon sample volume and sulfate ion content.

937 APTIC NUMBER 12492

Sawatani, Tsugio
THE PROBLEMS OF ODOR NUISANCE. 4. THE MEASUREMENT OF ODOR. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 2(1): pagination not given, 1967. 9 refs. Translated from Japanese. 19p.

The measurement of odors is generally divided into separating and estimating the components of a gas sample and measuring the intensity of an odor. There are few occasions when the components of a sample can be determined by gas chromatography, so measurements are usually made with concentrators. Measurements of the intensity of an odor generally depend on the sense of smell.

Because there is no way to evaluate the response to an odor on a numerical basis, equipment for measuring odor itensity has not been developed. A specific bond is assumed to exist among the molecules of a substance which has an offensive odor. For example, ammonia, methyl, and amine have a similar smell that is presumably due to the -NH2 group. The idea the flexible vibration of the N-H coupling stimulates the olfactory nerve implies a possible relationship between the propagation and quality of a small and the infrared-absorbing wave-length of its molecule. Problems complicating the measurement of a gas mixture are discussed, and a simple sampling apparatus is described for measuring the odor, of a mixed gas by the salt-solution equilibrium process.

938 APTIC NUMBER 12328

Sawicki, Carole E. and Eugene Sawicki
THIN-LAYER CHROMATOGRAPHY IN AIR POLLUTION RESEARCH. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics. 90p., 1969 (?). 112 refs.

Thin-layer chromatography is useful in the trace analysis of nanogram to microgram amounts of the physiologically active chemicals present in extremely complicated air particulate mixtures containing tens of thousands to millions of compounds. Advances in the thin-layer chromatographic analysis of organic air pollutants are reviewed, with special emphasis on these physiologically active compounds. Methods of location and characterization involving fluorescence and pH effects, quenching techniques, and color tests are illustrated. Functional group analysis in terms of separation, location, characterization, and assay is outlined for the following classes of compounds: arenes, aza arenes, aromatic carbonyl arenes, phenols, aromatic amines, amino acids, and carbohydrates. (Author abstract modified)

939 APTIC NUMBER 12144

Sawicki, Eugene, Thomas R. Hauser, and Ronald Wilson
SPECTROPHOTOMETRIC DETERMINATIONS OF GLYOXAL WITH 4-NITROPHENYLHYDRAZINE, 2-AMINOBENZENETHIOL AND 2,3-DIAMINOPHENAZINE. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Lab. of Engineering and Physical Sciences, 14p., 1960 (?). 11 refs.

The 2-aminobenzenethiol, 1,2-dianilinoethane, 2,3-diaminophenazine, 2,4-dinitrophenylhydrazine, and 4-nitrophenylhydrazine procedures for the spectrophotometric determination of glyoxal were compared. The 4-nitrophenylhydrazine procedure was the most sensitive for the determination of glyoxal, though pyruvaldehyde and biacetyl also react with this reagent. Its molar absorptivity was four times greater than that obtained with the 2,3-diaminophenazine procedure. Its dilution factor (essentially the final volume to which a unit volume of test solution can be diluted) was good. The 1,2-dianilinoethane procedure was least sensitive. All methods, except the 1,2-dianilinoethane, obeyed Beer's law. All colors were stable enough for satisfactory measurements to be made. The most satisfactorily reproducible results were obtained with the 4-nitrophenylhydrazine method. The 2-aminobenzenethiol and the 2,3-diaminophenazine procedures were the most highly selective for glyoxal.

940 APTIC NUMBER 11675

Sawicki, E. and C. Golden
TLC-FLUORIMETRIC ANALYSIS FOR ATMOSPHERIC SCOPOLETIN. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Chemical and Physical Research and Developmetn Program, 19p., July 1968. 19 refs.

A method is described for the characterization and assay of scopoletin, a hydroxycoumarin derivative previously identified in tobacco and tobacco smoke. The evidence for its presence in airborne particulates, house dust, and coffee roast effluents consists of R(f) values obtained with silica gel thin-layer chromatography and mobility values obtained with paper electrophoresis, as well as fluorescence spectra obtained from the chromatogram and from methanolic, alkaline methanolic, and sulfuric acid solutions. By use of a procedure involving thin-layer chromatography spectrophotofluorimetry, scopoletin was assayed in these various samples. Recovery of scopoletin from enriched airborne particulates was 97%. The various separations and fluorimetric examinations revealed the presence of a large number of 'oxygenated' fluorescent unknowns in the various samples; these substances will be studied for possible allergy significance. (Author abstract modified)

941 APTIC NUMBER 12370

Sehmel, G. A. and L. C. Schwendiman
PARTICLE DEPOSITION WITHIN A CURVED SAMPLING PROBE. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II: Physical Sciences, Part 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 88-92, Oct. 1968.
CFSTI: BNWL - 715

Air particle samples are often collected under conditions in which the filter collector medius can not be placed directly in the air stream. Thus, the sampled air must reach aerosol particle deposition was measured in 4.7 to 5.8-in. lengths of 0.135 to 0.40-in. ID tubing formed on a 4.4-in. radius of curvature. For a constant sampling velocity, the deposition increased with an increase in particle size and a decrease in tubing ID. For a constant tube ID, deposition increase with both flow rate and particle size until reentrainment became important. For transition flow between laminar and turbulent, the deposition was minimum for an intermediate Reynolds number for any constant particle size for which reentrainment was not important. The disposition was significant for all flow rates and must be considered in interpreting the data for any sample passed through a curved tube in either laminar or turbulent flow. (Author abstract modified)

942 APTIC NUMBER 12384

Soltau, J. P. and K. Campbell
THE SAMPLING AND MEASUREMENT OF EXHAUST EMISSIONS FROM MOTOR VEHICLES. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 14p. 4 refs. (Nov. 25-26, Paper 9.)

Accurate measurements of exhaust emissions can either be made as continuous records or as an average value over a perid of time or cycle. The principal instrument in current use, the rapid response non-dispersive infrared gas analyser is described. A part from carbon compounds, it can also detect with accuracy oxides of nitrogen. Future trends in pollution measurements are oriented towards the evaluation of the mass emitted during a predetermined cycle instead of the average concentration. With this in view, new sample collection methods such as total bag sampling and variable dilution sampling were developed and are discussed. The British Technical Council Analytical Committee was formed four years ago to advise on and discuss exhaust gas measurement techniques. Its achievements, including the establishment of gas and car correlation schemes and the laying down of instrument specifications, are reviewed in detail. (Author abstract modified)

943 APTIC NUMBER 12148

Southerland, James H.
A SURVEY OF AIR POLLUTION IN THE CHATTANOOGA METROPOLITAN AREA. Preprint, 11p., 1969. 2 refs. (Presented at the Environmental and Water Resources Engineering Conference, 8th Annual, Nashville, Tenn., June 5, 1969.)

The procedures used for the Chattanooga, Tennessee-Rossville, Georgia Interstate Air Pollution Survey are presented. A general examination is given of the methods used in the conduct of the field investigation, including site selection, sampler selection, and frequency of sampling for particulates (high-vol samplers), sulfur dioxide (West - Gaeke and continuous automatic conductivity instruments), nitrogen oxides (Saltzman colorimetry), oxidants (colorimetry), and carbon monoxide. Brief descriptions of analytical techniques and procedures used for the study are presented, including the effects studies for materials, vegetation, and health, as well as the aerometric-metecrological network. Aspects of an emission inventory, air quality standards and implementation plans, and air quality improvement planning are discussed. A summary of findings will be presented in a forthcoming technical report. (Author abstract modified)

944 APTIC NUMBER 18033

Stanley, Charles W. and John I. Morrison
IDENTIFICATION OF ORGANOPHOSPHATE PESTICIDES BY GAS CHROMATOGRAPHY WITH THE FLAME PHOTOMETRIC DETECTOR. J. Chromatog., 40(2):289-293, March 25, 1969. 8 refs.

Determination of retention times on gas chromatographic columns of different polarity is one technique for compound identification. A method was used for the detection and identification of organophosphate pesticides which consists of comparing the peak retention times of an unknown with those of a known sample on two columns of different polarity plus detection of the compounds with a flame photometric detector in both the phosphorus and sulfur modes. The conditions of analysis and some typical curves for parathion, malathion, methyl parathion, and DEF are given.

945 APTIC NUMBER 12143

Stanley, Thomas W. and Eugene Sawicki
A TEST FOR THE AROMATIC HYDROCARBON CONTENT OF URBAN ATMOSPHERES. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Community Air Pollution Program, 13p., 1959 (?). 15 refs.

A simple analytical procedure is described for estimating aromatics in particulate matter and in air. A color test is performed which involves reacting the hydrocarbons with piperonal chloride in trifluoroacetic acid; as the complexity of the aromatic hydrocarbon increases, the absorption of the colored reaction product shifts toward the infrared. Since the color is due to a diarylmethane type of dye, aliphatic compounds do not react; the only aromatics among those tested that do not react are benzene and electronegatively substituted derivatives, such as quinones and nitro compounds. Benzene can therefore be used to extract dusts. If an aromatic compound (or group) is present in increased extent in the air of a community, the test will give a quick estimate of the concentration. For example, it is sensitive to but will not discriminate between phenols; carcinogens, such as 2-acetylaminofluorene and benzo(a)pyrene; aromatic ethers; vile-smelling aromatic sulfides, selenides, and mercaptans; and polynuclear aromatic hydrocarbons. When performed on benzene-extracted air particulates, a fairly distinctive aromatics finger print is obtained; e.g., London winter samples have thus far always given a blue color with one intense band near 600 millicrons. A K-value is introduced from which an estimate of the amount of aromatics in the air can be determined in terms of some particular compound.

946 APTIC NUMBER 12502

Stevens, Robert K., Andrew E. O'Keeffe, and Gordon C. Ortman
A GAS CHROMATOGRAPHIC APPROACH TO THE SEMI-CONTINUOUS MONITORING OF ATMOSPHERIC CARBON MONOXIDE AND METHANE. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics, 15p., 1969. 5 refs.

An automated gas chromatographic system with a flame ionization detector was developed to measure sub-part-per-million levels of methane and carbon monoxide in polluted air. Special attention was given to the design of a stripper column to prevent water vapor, carbon dioxide, and hydrocarbons other than methane from reaching the main (molecular sieve) column. A catalytic surface quantitatively converts carbon monoxide to methane for measurement with the flame ionization detector. Repetitive gas chromatographic measurements of carbon monoxide and methane in ambient air in a residential area were recorded with this automated system over a three-month period. The tests indicated that carbon monoxide and methane can be routinely monitored at sensitivity levels from the 0-5 ppm full scale on a 1-millivolt recorder at accuracies within plus or minus 3% and from the 0-100 full scale within plus or minus

11. The system can be operated unattended for several weeks, consistent with the needs of programs for continuous air monitoring in several major cities and of anticipated monitoring efforts on regional and local levels.

947 APTIC NUMBER 12409

Stevens, R. H. and H. A. Kermicle
BIO-PARTICLE CARBON ANALYZER OPERATION AND MAINTENANCE MANUAL. Union Carbide Corp., Oak Ridge, Tenn., Nuclear Div., Rept. K-L-6211, 53p., Aug. 30, 1968.
CFSTI: KI 6211

An instrument is described for analyzing individual biological particulates such as cells, pollen, and spores for carbon by sampling them from a drop of liquid media onto a moving wire and analyzing each particle separately in a solid-sample typed of hydrogen flame ionization detector. Data from the individual analyses are stored and then displayed after a sample run in the form of a carbon-content-distribution histogram. The smallest detectable carbon weight is approximately 10 to the minus 12th power gm, and this produces about 6.5 times 10 to the minus 15th power coulomb of charge over a period of about 0.1 sec. Under ideal conditions of population and dispersion, up to two or three particles can be analyzed per second for a typical wire speed of 0.3 in./ sec from a suspension containing in the neighborhood of 200,000 particles/milliliter. The suspension media should be inorganic and free of sodium or potassium, ammonium salt solutions appear to be satisfactory. Carboxylic and aldehydic carbon atoms are not detected; hydrocarbon alcoholic and halogen-substituted bonds are, though to a lesser degree than the basic C-H structure. Thus the carbon-content distribution produced by this analyzer represents total carbon to the extent of the absence of carboxylic and/or aldehydic bonds. The precision of the analytical quantitation of detected carbon is satisfactory and well within the natural volume dispersion of narrow, natural populations such as red cells and certain spores. (Author introduction modified)

948 APTIC NUMBER 12315

Stull, T. W.
A RAPID GAS-LIQUID CHROMATOGRAPHY METHOD FOR THE QUANTITATIVE ANALYSIS OF 1, 1, 2 TRICHLORO 1, 2, 2 TRIFLUORO ETHANE (FREON 113) IN AIR. Mason and Hanger-Silas Mason Co., Inc., Burlington, Iowa, Engineering Div., Contract DAAA09-68-C-0468, IN-163, 8p., Oct. 10, 1968. 3 refs.
CFSTI, DDC: AD 679035

A method is described for the quantitative analysis of 1, 1, 2 trichloro 1, 2, 2 trifluoro ethane in atmospheric concentrations from one to 1000 ppm. This gas-liquid chromatographic technique utilizes the flame ionization detector and employs a unique method of standardization. The standard can be prepared and a complete concentration range chromatographed and graphed in about 15 min, and unknown analyses can be performed at a rate of about 60 per hr. Both lower and higher concentrations than those described can be easily analyzed by adjustment of the prepared standard, instrument conditions, or sample size injected. Reliable and accurate results have been obtained during the two years that the method has been in use, and the method is simple, rapid, and easy to carry out. (Author abstract modified)

949 APTIC NUMBER 12213

Tabor, Elbert C.
HIGH-VOLUME AIR SAMPLING. Preprint, Purdue Univ., Lafayette, Ind., 25p., 1968. 22 refs. (Presented at the Indiana Air Pollution Control Conference, 7th, Lafayette, Oct. 15-16, 1968.)

Several different sampling techniques and devices (filtration, electrostatic and thermal precipitation, and impaction) may be employed to collect suspended particulate pollutants from ambient air. Of the various techniques, filtration has been found to be the most suitable for routine air sampling. The so-called high-volume filter sampler is generally accepted as the instrument of choice for this purpose. Currently between 1500 and 2000 such samplers are in the possession of federal, state, and local air pollution control agencies, industries, and research organizations for either routine or intermittent use. The sampler's development, calibration, and sampling procedure are outlined. Three techniques have been applied to the maintenance of constant air flow through the sampler during the sampling period and these are discussed. Improvements in sampler performance have resulted from incorporation of automatic timers, flow rate recorders, and constant flow devices into the basic system. Although the high-volume samplers presently in use are reasonably adequate, there remains a need for the development of a second generation sampler specifically designed to meet the requirements for suspended particulate sampling and monitoring.

950 APTIC NUMBER 17363

Takahashi, Taiji
THE METHOD OF DETERMINATION OF BACTERIA IN THE AIR. (Kankyo eisei ni okeru kuchusaikin kensaho). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 7(5):12-18, Jan. 1, 1970. 12 refs.

Various methods for determining atmospheric microorganisms which cause air pollution in the field of environmental health were discussed. The establishment of standarized methods is encouraged in view of the increasing importance of environmental health. Methods which are easy to handle, carry, and use and can collect and analyze floating microorganisms without destroying them during testing were introduced. The Hess method uses agar-agar spread inside a glass tool with a small hole for air. The Petri method is more reliable. Microorganisms are caught through quartz sand which are divided and placed in a petri dish and the number of cultivated microorganisms are counted. The Ficker method is more advanced than the Petri method in its use of glass particles instead of quartz sand which is opaque to the microorganism. The Miquel method uses a liquid medium and the microorganism contained in air, filtered through the liquid are seized. The Esmerich method is a revision of the Miquel method in which whole microorganism are not perfectly sized. The incomplete separation of the microorganisms stuck in the dust of the Petri and Ficker methods and the possibility of an error in counting the microorganisms in the liquid

medium of the Miquel and Emmerick methods was solved by the Oker-Blom method. Other methods are presented which are based on the applied theory of those outlined above. The deposition method and aerosol method were concluded to be the most applicable.

951 APTIC NUMBER 12451

Takeuchi, Juji, Eiichi Ito, Kiyoshi Kubo, Masako Kusumoto, Toshio Toyama, Takeo Arakawa, Itsuro Chida, Samon Maeda, Masami Arai, Koichi Murakami, Gunji Kawasaki, Toshiro Matsumura, Yukio Kubo, Yuki Morishita, Kunihiko Asagino, Eikuji Kimura, Noboru Yamate, Mitsuru Udagawa, Kazuo Shimizu, Kentaro Yagome, Masanobu Nagata, Fumiko Fujie, and Toshiichi Okita
MEASURING METHODS. (2). Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 2(1):80-87, 1967. Translated from Japanese. 32p.

Experimental procedures employed in atmospheric contaminant studies are briefly reviewed and evaluated. They concern the following: measurement of atmospheric acrolein; measurement of aerosol weight distribution with a cascade centripeter; determination of NO3-N in water collected in deposit gauges; continuous colorimetric measurement of atmospheric formaldehyde; measurement of SF6 employed as a tracer of exhaust gas; simple determination of trace quantities of atmospheric fluoride with alkalized filter paper; and determinations of the correlation between concentrations of aerosols and radon. Also reported are measurements of air particle pollutants with a self-recording impactor; a survey of air pollution based on automatic recorders; the use of a telemeter system to transmit data from the automatic recorders; the development of a stablized high voltage power source for the measurement of size distribution and concentration of particles in the atmosphere and in flue gas; measurements of atmospheric trace metals by emission spectrophotometry and atomic absorption spectrophotometry; measurements of particles with high volume samplers; studies of the efficiencies of shelters used in the PbO2 candle method for sulfation rate measurements; and a procedure for measuring aldehyde concentrations in the atmosphere.

952 APTIC NUMBER 16871

Thoen, G. W., G. G. DeHaas, and R. H. Austin
CONTINUOUS MEASUREMENT OF SULFUR COMPOUNDS AND THEIR RELATIONSHIP TO OPERATING KRAFT MILL BLACK LIQUOR FURNACES. Tappi, 52(8): 1485-1487, Aug. 1969. 4 refs.

A continuous instrument has been designed and built to measure sulfur dioxide and reduced sulfur compounds in the parts-per-million and parts-per-billion ranges. The instrument has been placed in operation on several black liquor recovery furnaces before the direct contact evaporator. Operation parameters under most possible conditions have been measured and correlations between sulfur dioxide and reduced sulfur compounds have been made. Steam production and degree of smelt reduction have also been determined in relation to the concentrations of the sulfur compounds. (Author's Abstract)

953 APTIC NUMBER 12226

Thomas, D. H.
THE CALIBRATION OF CASCADE IMPACTORS. Atomic Weapons Research Establishment, Aldermaston (England), Rept. O-94/64, 15p., Sept. 10, 1964.
CFSTI: AWRE-O-94/64

Cascade impactors were used in joint U. K. and U. S. field experiments to determine the airborne concentrations of plutonium and uranium and to estimate the particle size distribution of these materials. The calibration parameters selected as most suitable for use in evaluating data are 'characteristic diameters.' The characteristic diameter for an impactor stage is obtained directly from the collection efficiency relationship of the preceding stage. The material collected on a stage is assumed equal to the mass of all particles between the characteristic diameter for that stage and that of the succeeding one. Measurement errors induced by this assumption are discussed and the agreed characteristic diameter values for both instruments are given. Mass median diameter values are also reported for the Casella impactor. Neither instrument will necessarily sample particle sizes greater than 50 micron correctly, but there is evidence to show that they should do so for the smaller particles which are significant in estimating inhalation hazards.

954 APTIC NUMBER 18016

Thomas, M. D. and R. E. Antower
THE MICRODETERMINATION OF FLUORIDE IN VEGETATION. J. Air Pollution Control Assoc., 19(6):439-442, June 1969. 16 refs.

This paper describes a micro method for the determination of the fluoride content of plant materials, particularly the leaves. The samples are dried and ground to a fine powder. 50 mg. samples are burned in oxygen in 250, ml separatory funnels or in 300, ml Erlenmeyer flasks. The gaseous products of the combustion are absorbed in 0.1N NaOH in the closed funnel or flask and transferred to a small covered plastic dish in which the fluoride is diffused to tiny droplets of 1N NaOH solution distributed over the lower side of a tight fitting cover. The diffused fluoride is dissolved in water and determined colorimetrically by the SPADNS reagent. (Author's Abstract)

955 APTIC NUMBER 12305

Thompson, Richard J., George B. Morgan, and Larry J. Purdue
ANALYSIS OF SELECTED ELEMENTS IN ATMOSPHERIC PARTICULATE MATTER BY ATOMIC ABSORPTION. Preprint, Instrument Society of America, Pittsburgh, Pa., 19p., 1969. 4 refs. (Presented at the Symposium of the Instrument Society of America, New Orleans, La., May 5-7, 1969.)

The use of atomic absorption spectrophotometry for the analysis of some metals in atmospheric particulate matter is described; the procedure affords an accurate, rapid, and sensitive means for the determination of trace quantities of selected metals. The sample preparation as outlined is applicable to both emission spectroscopy and atomic absorption spectroscopy. Atmospheric particulate matter is collected for metals analysis on glass

fiber filters and membrane filters. These filters are ashed in an oxygen plasma at low temperature obtained by applying a radio frequency voltage to coils surrounding sample chambers, which contain oxygen at low pressure. The sample residue is then extracted with a mixture of nitric and hydrochloric acids and the extracts analyzed for selected elements using atomic absorption spectrophotometry. Some of the effects that are encountered include matrix effects, due to both salts and silica, and the efficiency of recovery of knowns added, both to atmospheric particulates and to a 'synthetic particulate.' Analytical data for typical samples are presented. (Author abstract modified)

956 APTIC NUMBER 11978

UBL, Zdenek
ORIENTATIONAL METHODS OF DETERMINATION OF SULPHUR DIOXIDE IN THE ATMOSPHERE. In: Preprints of the Czechoslovak Reports. International Symposium of the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 43-50. 5 refs.

A new method is proposed for semiquantitative determinations of atmospheric sulfur dioxide in Czechoslovakia. It combines the use of Soxhlet thimbles, saturated with a solution of potassium carbonate, water, and glycerine, to determine the amount of sulfate produced by the oxidation of SO2 using polyethylene dishes filled with a sodium hydroxide-glycerine solution. The dishes are exposed in pairs for 3-4 days and the absorbed SO2 is then determined either polarographically or coulometrically. Results of the thimble method are expressed in mg SO2 per week; results of the second method are expressed in mg SO2 per day or in mg SO2 per day times 100 sq cm. When pairs of values calculated by this combined technique are compared with actual measured mean concentrations, significant agreement is found.

957 APTIC NUMBER 12106

Ullrich, O. A.
SIZE ANALYSIS OF FINE PARTICLES AND RESULTS OBTAINED WITH AN ELECTRICAL SENSING-ZONE PARTICLE ANALYZER. Instr. Soc. Am., Conf. Preprint, 20p., 1960, (Presented at the Instrument Society of America Conference, New York, Sept. 26, 1960.)

The principles and methods of particle-size analysis are reviewed, together with data handling techniques. Special consideration is given to a new particle-analysis device utilizing an electrical sensing zone. The operation of this instrument is based on the detection of particles suspended in a slightly conducting liquid as they are drawn from one chamber to another through a small orifice. An electric current, established in the liquid between electrodes in the two chambers, is altered momentarily when a particle passes through the orifice. The change in current is detected as a pulse in a discriminating circuit. By increasing the sensitivity of the pulse-detection circuit, a cumulative count of particles larger than a given size can be made over the entire range covered by the instrument. Advantages of the instrument are that it provides high resolution in size distribution and information on the agglomeration tendencies of a sample that cause changes of distribution with time. It also yields a statistically significant number of counts and permits the identification of the presence of particles both above and below the actual counting range. The instrument has been successfully used in size-distribution measurements covering a range of fine solid particles encountered in industry and in the measurement of droplet size in emulsion systems.

958 APTIC NUMBER 12140

Wartburg, Arthur F. and Bernard E. Saltzman
REMOVAL OF INTERFERING SULFUR DIOXIDE IN ATMOSPHERIC OXIDANT ANALYSIS. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Lab. of Engineering and Physical Sciences, 18p., 1964 (?). 7 refs.

In order to improve the accuracy of iodimetric measurements of total oxidant consisting predominantly of ozone by manual and instrumental methods now in use, a solid absorbent material was developed for conveniently removing sulfur dioxide from an air sample stream with little or no concurrent loss of ozone. Chromium trioxide acidified with sulfuric acid, supported on glass-fiber paper, was the most effective of various scrubbing chemicals, and should make possible measurements of oxidant levels without serious interference from 100-fold excesses of SO2. The optimal area of absorbent paper for use in a 100-mm U tube at the test flow of 140 ml/min was about 6 sq in. A certain conditioning time is required before ozone is no longer appreciably absorbed; the concentration of chromium trioxide affected this time but not final performance. Work is in progress to determine whether the absorber causes any losses of the oxidant from natural and synthetic smog mixtures. Field tests completed to date indicate that the performance of the absorber does not deteriorate during ordinary continuous use for 30 days.

959 APTIC NUMBER 17349

Watson, D. C., R. W. Hale, and H. H. Randolph
AUTOMATION OF THE GAS CHROMATOGRAPHIC ANALYSIS FOR WATER IN SMOKE PARTICULATE MATTER. J. Chromatographic Sci., 8(3):143-146, March 1970. 6 refs.

An automated system is described for gas chromatographic injection of laboratory samples of water from smoke particulate matter. The system uses a master timing device to bring successive samples in line with the sample probe. After a predetermined interval, the sample probe control is actuated, and the probe immersed in the liquid sample. The continuous action of a sample transfer pump draws the sample from its container and through a liquid-injection valve. At a second predetermined interval, the valve control is actuated and the valve then operates to position a portion of the sample in the gas chromatographic carrier gas stream. Separation and analysis of sample components then proceeds as in normal gas chromatography. In the system, peak response is measured by an electronic integrator from which digital signals are fed through an interface to an electronic desk-top calculator. Proper programming of the calculator provides calculations on a series of concentration units. Replicate injections of a sample with the automatic injection device was more reproducible than manual injections of the same sample.

960 APTIC NUMBER 12427

Webster, F. X.
COLLECTION EFFICIENCY OF THE ROTOROD FP SAMPLER. Metronics Associates, Inc., Palo Alto, Calif., Aerosol Lab., Contract DA-42-007-CML-543, TR-98, 50p., Jan. 31, 1963. 3 refs.

The results of 28 small-scale field trials were reported which investigated the collection efficiency of the Rotorod FP sampler, a low-cost impaction sampling device now widely used for the collection of 1-5 micron FP atmospheric tracer aerosols. Since the high impaction speed of the Rotorod is essentially constant over a wide range of wind speeds, its collection efficiency is primarily a function of the particle sizes comprising the tracer aerosol to be sampled. Four to eight trials were run with each of 6 different lots of FP tracer material in order to investigate the dependency of collection efficiency on particle size; the mass-mean diameters (MMD) of these 6 lots ranged from 1.8 - 3.8 micron. The Rotorod collection efficiency increased from 28 to 69% as the tracer aerosol MMD was increased from 1.8 to 3.8 micron. Within a given trial or series of trials using tracer aerosols having the same or closely similar MMD, the collection efficiency coefficient of variation ranged from a minimum of 0.058 to a maximum of 0.156. Collection efficiencies obtained with tracer aerosols having particle sizes more nearly representative of those lots which are currently being used in atmospheric diffusion studies ranged from 53% for 2.4 micron MMD to 61% for 3.4 micron MMD. Graphs are included to show the dependence of Rotorod collection efficiency on either MMD or particles per gram; for trials using tracer aerosols for for which the values of either of these particle size parameters are known, the collection efficiencies to be expected may be estimated from these graphs. (Author abstract modified)

961 APTIC NUMBER 18001

West, Philip W. and Shan L. Sachdev
AIR POLLUTION STUDIES. THE RING OVEN TECHNIQUE. J. Chem. Educ., 46(2):96-98, Feb. 1969. 6 refs.

The ring oven methods are based on chemical reactions that are carried out on filter paper. The technique is useful for separation, concentration, detection, and determination of submicrogram quantities of various materials. The method is particularly attractive for studies of airborne particulates. A very simple and inexpensive method is described for the collection of airborne particulates and a method based on the ring oven technique is described for the identification and determination of the airborne particulates. The equipment used is inexpensive and can be assembled with simple household appliances. The ring oven methods are usually selective or even specific, examples are listed. The method applies to the microgram to nanogram range. (Author's Summary)

962 APTIC NUMBER 11680

White, William F.
QUALITATIVE ANALYSIS OF GAS MIXTURES BY MICROWAVE SPECTROSCOPY. Preprint, American Chemical Society, Washington, D. C., 39p., 1968. 3 refs. (Presented at the American Chemical Society, 155th National Meeting, San Francisco, Calif., March 31-April 5, 1968.)
CFSTI: N68-34763

The value of microwave spectroscopy in qualitative analysis of gas and vapor mixtures was experimentally established. Except for a very few simple gases, most polar gases and vapors have absorptions throughout the range accessible to typical microwave spectrometers. It is not necessary to use the entire coverage of the spectrometer to detect most molecules, since a high percentage will have lines in a frequency interval much smaller than the total spectrometer range. The data cataloged so far in K-band includes molecules with 0 to 1500 lines, with the average number somewhat less than 400 per molecule. There is a good chance of finding one or more absorptions due to the majority of molecules by scanning only a portion of the range available. Normally, the stronger lines are preferred, since they provide better sensitivity to trace gases; but any observed absorption provides valid information. The maximum scan rate which can be used in a given case depends on strength and wise of the lines to be observed, since these factors determine the necessary detector time constant. These absorption parameters are in turn dependent on the sample composition and pressure. Resolution of the methylene chloride spectrum is discussed in detail, and the application of spectra data to analytical work is reported. Work being done to automate the operation and data reduction of the spectrometer is revieved.

963 APTIC NUMBER 12336

Williams, Jerome
THE DESIGN OF AN OPTIMUM BEAM TRANSMITTANCE METER. Johns Hopkins Univ., Baltimore, Md., Chesapeake Bay Inst., Contract Nonr 4010(11), Proj. NR 083-016, TR-46, 11p., Nov. 1968.
CFSTI, DDC: AD 679167

A conventional beam transmittance meter (alpha meter) consists basically of a collimated light source producing a relatively narrow beam which shines through the medium under examination to a light sensitive receiver. This receiver is fronted by an optical system which restricts the collected light to that contained within a relatively small angle. Most of the light scattered out of the main beam is thus prevented from being recorded by the instrument. To design a beam transmittance meter which would give transparency readings independent of instrument parameters, five instrument parameters varying from instrument to instrument were examined. A dual beam design is suggested which appears to allow optical measurements to be independent of instrument size and configuration. The meter will have identical optics in each beam, the optics having a very small ratio of beam width to beam height.

964 APTIC NUMBER 11708

Wilson, Thomas O. and E. E. Mason
GASEOUS MONITORING FOR THE INTEGRATED LIFE SUPPORT SYSTEM AT LANGLEY RESEARCH CENTER. Preprint, 17p., 1967. 7 refs. (Presented at the Conference on Atmospheric Contamination in Confined Spaces, 3rd Annual, Dayton, Ohio, May 9-11, 1967.)

The Integrated Life Support System was conceived to study the problems of integrating regenerative equipment to operate in a negligible gravitational field. The three major contributors (man, machine, and materials) to atmospheric contamination were fully integrated. The gas monitoring system associated with the Integrated Life Support System was described. Instrumentation of high sensitivity was sought. The most notable instrument was the total hydrocarbon analyzer. Giving a first approximation of the contaminant problem. The results appeared to be more reliable than results from more sophisticated instrumentation and sampling procedures. Gas chromatography, infrared and mass spectroscopy, and microwave analysis will give the final definition of the contaminants. Before these instruments can be truly effective, the problem of sampling and sample handling will have to be solved. A 7-day test was conducted. The most significant observation in atmospheric monitoring was the low level of contamination. The baseline for total hydrocarbon before the hatches were closed was 3 ppm. After hatch closure, it slowly rose to stabilize at 6 ppm. There was one excursion above this level to 15 ppm which the contaminant control system quickly removed. The nonadapted nose is still the most sensitive detector for odoriferous compounds in small quantities. During the testing, a disagreeable odor was observed. The air contaminant was not observed by the analytical instrumentation. Much data are yet to be derived from the test chamber on man, machine, and material interactions. (Author summary modified)

965 APTIC NUMBER 17336

Yagcae, Kentaro
AIR POLLUTION SURVEY BY EMISSION SPECTROCHEMICAL ANALYSIS. (Hakko bunko bunsekiho ni yoru taikiosen chosa). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 16(1):1-8, Feb. 28, 1970. 23 refs.

Air pollution research by emission spectrochemical analysis, which has a high sensitivity and can analyze many components simultaneously was reviewed. This method is not perfected either in Japan or in the United States. Metallic ingredients in smoke particles are mainly analyzed by the NASN (the National Air Sampling Network) method. The smoke particles on the sample filters are treated by intense heating, extraction, concentration, calculation, and electrolysis. A platform type graphite electrode is used and a filter extract (without sampling) and sample extract are set in them with a drop of methanol, which are analyzed by the spectral method. Spectral lines on the film are measured with a microphotometer regarding the black lines. Losses of lead, cadmium (caused by the pyrolysis of organisms) and chromium (by using nitric acid for extraction) is removed by low temperature incineration or by hydrochloric acid extraction. As internal standard substances tin, indium, and palladium are effective. The hygroscopicity of lithium chloride and graphite powder is improved by the electrode heating apparatus. The direct analysis method, silver membrane filter method, and ASTM (Methods for Emission Spectrochemical Analysis) method were introduced. The plasma jet method is being studied. Research on air pollution indicates that industrial areas are different from the market and dwelling areas. It is not yet possible to reduce metallic pollution because of the complex factors of natural sources, fuel oil combustion, exhaust gases from automobiles and other special sources. The ratio of sulfur to selenium is significant as an indicator of fuel pollution. The manganese to vanadium ratio and the concentration of vanadium provide clues in determining the pollution pattern in big cities or industrial areas. The environmental standard is improving. A sulfur oxide floating particle quantity standard was suggested.

966 APTIC NUMBER 17356

Yamada, T.
METHODS OF ANALYZING SO3 IN FLUE GASES. (Haigasuchu no SO3 no bunsikihoho). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 22(2): 47-50, Feb. 28, 1970. 6 refs.

Methods of analyzing low concentrations of sulfur trioxide in gases from crude petroleum boilers are reviewed. Sulfur trioxide in high concentration produces a large amount of sulfuric acid mist interfering with the sampling process. The Isopropyl alchol, condensation, sodium chloride, and automatic methods analyzing low sulfur trioxide concentrations are compared. Isopropyl alchohol (80%) is considered to be the most suitable agent for an absorbing solution, since it does oxidize sulfur dioxide. The gas sample is heated so that its temperature is above acid dew point. Nephelometric sampling techniques, which involve precipitation, are not as accurate as volumetric analysis. Titration of the absorbing solution by a standard barium chloride solution (N/100) with indicator thorin is convenient. A sampling apparatus similar to Corbett's is effective for a field survey. Accurate determination requires the addition of enough nitrogen gas (without oxygen gas) to remove sulfur dioxide. Optical determination of titration termination with barium perchlorate is effective with very low concentrations. Sulfur trioxide is condensed and separated without the condensation of vapor in the condensation method, which utilizes the fact that the dew point of vapor in flue gas is less than 50 C. Values determined by the condensation method agree well with those derived by the IPA method. In the sodium chloride method, (70 C) only sulfur trioxide is absorbed, not vapor or sulfur dioxide. Three to approximately 600 ppm can be determined to 5 to approximately 10% error. Automatic analysis by the barium chloranilate method is not yet used in Japan. An automatic colorimetric analyzer is complicated in construction and unsuited to accurate sampling for an extended period.

967 APTIC NUMBER 18039

Yamada, Victor M. and Robert J. Charlson
PROPER SIZING OF THE SAMPLING INLET LINE FOR A CONTINUOUS AIR MONITORING STATION. Environ. Sci. Technol., 3(5):483-488, May 1969. 2 refs.

Sampling inlet lines for continuous air monitoring stations are frequently installed without consideration of diffusive loss of

pollutants to the tubing walls. The average intake system in the U. S. may very well cause serious errors in pollution measurement. The proper size and flow rate can be easily achieved by using a large duct and a blower for air movement. Such systems also provide simpler and cheaper installations. (Author's Abstract)

968 APTIC NUMBER 17341

Yanagisawa, Saburo
INSTRUMENTS FOR MEASURING GASEOUS POLLUTANTS IN AIR --- ESPECIALLY AN AUTOMATIC CONTINUOUS RECORDER. (Taikichu gasujo osenbutsu no sokutei kiki --- shutoshite jidorenzoku sokutei kirokukei nitsuite ---). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 2(9):572-579, Oct. 15, 1966. 3 refs.

Of the harmful elements released into air, dust particles are removed fairly easily by common apparatus. The removal of gases except sulfur dioxide or carbon monoxide, however, is difficult, and little progress has been made. Gas analyzers used in Japan for measuring gaseous pollutants in air include a continuous measurement recorder for sulfur oxides and nitrogen oxides, a continuous automatic recording analyzer for carbon monoxide, and a filter tape harmful gas analyzer. After collection and condensation, the pollutants are analyzed by polarography, gas chromatography, infrared absorption, ultraviolet spectrometry, and mass spectrometry. The recent trend is the use of continuous automatic analyzers because of the high cost of labor. Operating principles and manufacturing companies of the instruments were described in detail.

969 APTIC NUMBER 17345

Zach, Dietrich
IMPORTANCE AND DETERMINATION OF THE PHOSPHATE CONTENT IN THE AIR OF SEMICONDUCTOR LABORATORIES. (Die Bedeutung und die Bestimmung des Phosphorgehaltes in der Luft von Halbleiterlaboratorien). Text in German. Chem. Tech. (Berlin), 21(11):711-713, Nov. 1969. 2 refs.

A method was developed for determining indoor traces of phosphorus in the air by spectrophotometric determinations of the substance with the aid of phosphorus vanadium molybdenic acid. The air is sampled with a membrane filter. Through subsequent treatment with an acid, the membrane decomposes; the phosphorus compounds are converted to phosphoric acid and then into phosphorus vanadium molybdenic acid. Measurements of the phosphorus content were taken in the offices of a semiconductor laboratory. The offices in the vicinity of the phosphorus diffuser had a much higher phosphorus content during the day than the remoter offices. The phosphorus pentoxide containing gas in the phosphorus diffusers escaped through leaks or after passing the cleaning devices and caused the pollution.

970 APTIC NUMBER 16458

Andreyev, B. G. and R. F. Lavrinenko
SOME DATA ON THE CHEMICAL COMPOSITION OF ATMOSPHERIC AEROSOLS IN CENTRAL ASIA. (Nekotoryye dannyye okhimicheskom sostave atmosfernykh aerozoley Sredney Azii). Text in Russian. Meteorol. i Gidrol., no. 4:63-69, 1968. 3 refs.

Central Asia is one region of the USSR whose atmosphere is severely polluted due to large areas covered with sand deserts and loesses, dryness of the climate, and high frequency of strong winds. Aside from their purely meteorological import, studies of the concentration and chemical composition of atmospheric aerosols are of direct interest in many engineering problems (corrosion of electric power lines, operation of natural-gas line compressors, etc.) and in the fields of sanitation and hygiene. This paper presents some results of the first such study carried out in Central Asia during September and October, 1966. Aerosol samples were collected near the ground and from aircraft in daytime horizontal flights at the 300 and the 600 meter altitude and in one flight in a sandstorm at the 300 meter altitude, by means of membrane and FPP-15 fabric filters as well as a twin-chamber trap with a water filter, separating particles of a size smaller than about 0.5 microns from those which are larger. In addition, samples of sandy soil, sierozem (gray desert soil) and solonchak (saline soil), most prevalent in Central Asia, were analyzed and the results compiled in a table. The chemical composition of the soluble constituents of aerosols and that of aqueous extracts of the surface layer of the soils was determined by the method of sediment analysis. The mean values of 30 series of aerosol measurements are given in tables as follows: HCO3(-), SO4(2-), Cl(-), NO3(-), Na(+), K(+), Mg(2+), Ca(2+), and NH4(+). The total ion concentration and the soluble part in micrograms per cubic meter, as well as the hydrogen ion concentration, expressed in terms of pH value, are also given. The relations existing between the compositions of the soils and of the aerosols at various altitudes, among the ionic components of aerosols, and between particle size and acidity of the molecular species constituting the aerosols are discussed.

971 APTIC NUMBER 12210

Anechina, P., F. Berrocal, J. M. Romero, J. de la Serna, and B. Sanchez F. Murias
AIR POLLUTION IN MADRID IN 1967. (La contaminacion atmosferica de Madrid el ano 1967). Rev. San. Hig. (Spain) 42(9-10):527-546, Sept.-Oct. 1968. 9 refs. Translated from Spanish. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 22p.

Air pollution in Madrid was studied in 1967. Samples were taken from three different zones in the city; zones of heavy urban traffic, zones of high industrial concentration, and residential and garden zones. The results showed a marked increase in air pollution over previous years. The amount of sulfur dioxide found was 100% higher than in 1966; the number of days with concentrations of SO2 over 200 microgram/l also increased. On certain days, SO2 concentrations of 0.6 microgram/l were exceeded. Smoke load was assessed during the last months of 1967. Values were higher than 300 micrograms/l. Carbon monoxide average concentrations were 11 ppm, but exceeded 100 ppm at peak hours. The concentration of nitrogen oxides remained unchanged, however, they were higher in winter. The sedimentary dust average per year was 278 mg/sq m/day. This was described as remarkable and was greater than the dust contamination in Paris during 1966. (Author summary modified)

972 APTIC NUMBER 18008

Cavanagh, Leonard A., Conrad F. Schadt, and Elmer Robinson
ATMOSPHERIC HYDROCARBON AND CARBON MONOXIDE MEASUREMENTS AT POINT BARROW, ALASKA. Environ. Sci. Technol., 3(3):251-257, March 1969. 12 refs.

The concentrations of low molecular weight hydrocarbons and carbon monoxide in uncontaminated Arctic air masses have been analyzed at Point Barrow, Alaska. Using gas chromatographic techniques, a variety of organic compounds were regularly observed in these air masses, and the following average concentrations were obtained: Methane, 1.6 ppm; butane, 0.06 ppb; acetone, 1.0 ppb; and n-butanol, 190 ppb. Carbon monoxide concentrations averaged about 90 ppb. Special investigations confirmed the unexpected presence of n-butanol in these samples. Sources of these organics are postulated. (Author's Abstract)

973 APTIC NUMBER 12156

Corn, Morton, Felix Stein, and Nurtan Esmen
THE SHAPE OF ATMOSPHERIC PARTICLES. (PROGRESS REPORT). Pittsburgh Univ., Pa., Dept. of Occupational Health, Research Grant AP 00431-04, Rept. 6, 60p., March 1, 1969. 8 refs.

Suspended particulate matter collected at an urban sampling site was analyzed for variations in particle shape, specific surface area and density, chemical composition of size-segregated aggregates, and particle residence time. The results are presented in the form of tables and graphs. A significant finding was the large variation in the distribution of particle shape. This suggests that modeling of the urban aerosol by using 'average particle shape,' as is done for certain quartz and coal dusts, is not feasible. Because of the variations, the reliable transformation of particle size distribution based on projected area measurement to one based on weight was not possible. Results to date show seasonal variations in specific surface area of particle samples, but little seasonal variation in average particle density. The results of chemical analyses of condensate indicate the presence of at least 20 identifiable organic components. With the instruments used, the weight of sample fractions obtained for chemical analyses after 24 hrs of sampling was insufficient. The mean weighted residence time of all suspended particles was calculated as on the order of 200 hrs. The removal velocity for most cases was several orders of magnitude higher than the particle terminal settling velocity in calm air.

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974 APTIC NUMBER 12358

Crawford, S. R. and M.-L. F. M. Weatherley
AIR POLLUTION IN GREAT BRITAIN. Centre Belge d'Etude et de Documentation des Eaux, Liege, Belgium, 17p., 1968. 2 refs. (Presented at the International Congress of the Centre Belge d'Etude et de Documentation des Eaux, 21st, Liege, Belgium, May 1968.)

Data are presented for smoke and sulfur dioxide emissions in Great Britain from 1952 to 1967. The data for smoke show a steady decrease in the amount emitted since 1954; by 1967, the values had dropped to 40% of 1954 values. The decrease is closely tied to the Clean Air Act of 1956, which prohibited the emission of dark smoke. Practically the whole of the smoke emitted during the period surveyed arose from the incomplete combustion of coal in inefficient boiler plants and furnaces. Considering the steady fall in the consumption of coal by industry and its replacement by oil, smoke emissions should decrease another 15% by 1975. Ground-level pollution is shown to be caused almost entirely by smoke from domestic heating. Despite the nation-wide decrease in smoke emissions, smoke levels are still unsatisfactory in the North where domestic provisions of the Clean Air Act have not been strictly enforced. The data for sulfur dioxide show that emissions have reached their peak and are not decreasing, despite increasing industrial activity. Continuing decreases are anticipated as North Sea gas and nuclear energy come into use. As with smoke, ground-level concentrations of sulfur dioxide are closely linked to domestic emissions.

975 APTIC NUMBER 11612

Guerin, M. R. and W. D. Shults
AIR QUALITY SURVEY. In: Analytical Chemistry Division Annual Report for Period Ending September 30, 1968. Oak Ridge National Lab., Tenn., Analytical Chemistry Div., Rept. ORNL-4343, UC-4 - Chemistry, p. 19-20, Dec. 1968.

The results of a survey of the levels of potential air pollutants at an industrial park in Clinton, Tenn. are summarized. It is concluded the air quality at this location is far superior to that of typical urban areas and, in many respects, is superior to that of most nonurban areas for which comparable information is available. The detection of measurable amounts of what seems to be cadmium is consistent with the report that a nearby industry makes heavy use of cadmium alloys. (Author conclusions modified)

976 APTIC NUMBER 17340

Kneip, Theo. J., Merril Eisenbud, Clifford D. Strehlow, and Peter C. Freudenthal
AIRBORNE PARTICULATES IN NEW YORK CITY. J. Air Pollution Control Assoc., 20(3):144-149, March 1970. 10 refs.

Seasonal and source effects on the particulate contaminants of New York City atmosphere were identified and the concentrations of these contaminants were related to the tissue concentrations in residents of New York City. Continual weekly samples of particulates were collected at three stations in New York City area on 8 by 10 in. glass fiber filters at a flow rate of 20 cfm. The sample was ashed and leached with nitric acid. Metals analyzed by the atomic absorption method include Pb, V, Cd, Cr, Cu, Mn, Ni, and Zn. Lead-210, total particulate, and benzene and acetone soluble organic material were also determined. The data were related to various meteorological parameters over a one year period to define significant seasonal and source influences, as well as site to site variations. Very significant inverse correlations to temperature were obtained for suspended particulates, vanadium, and nickel at both the Manhattan and Bronx sites. Particulates show a less significant inverse correlation to temperature in lower Manhattan. Oil-fired space heating sources appeared to account for as much as 50% of the particulates in the Bronx at the peak demand period. Lead, copper, and cadmium show a general inverse correlation to average wind speed, and a direct correlation to temperature. The latter is most likely due to an inverse relation between wind speed and temperature. The heating season input for particulates, vanadium, and nickel was so great as to overcome most of the dilution effect due to winds. The other elements having more constant nonseasonal inputs, definitely reflected, the effects of the wind. The most significant site effect occurs with cadmium, which has a concentration in lower Manhattan three times that of the Bronx over a period of six to seven months in the summer and fall. The differences observed for cadmium and particulates may be explained by emission source factors which were not studied. (Author abstract modified)

977 APTIC NUMBER 11627

Lahmann, Erdwin, Juergen Westphal, Kurt Damaschke, and Margot Luebke
CONTINUOUS OZONE MEASUREMENTS IN A HEAVILY TRAVELLED STREET. (Kontinuierliche Ozon-Messungen in einer verkehrsreichen Strasse). Text in German. Gesundh. Ingr., 89(5):144-147, 1968. 12 refs.

At two measuring stations in Berlin, continuous ozone measurements were taken from the summer of 1966 to the summer of 1967. The first measuring station was located in a busy street in Berlin Steglitz. The air samples were taken at 20 m and sometimes also at 2 m. The second station was in a quiet area without traffic; the samples were taken at 10 m. The results show that in the busy Schlosstrasse, maximum ozone concentration was about 5 pphm. Of the total number of individual measurements, 8.6% exceeded 1 pphm and only 2% exceeded 2 pphm. The maximum daily average was 3.2 pphm. Higher ozone concentrations were measured in summer than in winter. The average ozone concentrations in the traffic-free area were much higher than those in the busy street. Comparison of the diurnal variations of ozone concentration at the two stations clearly shows the influence of traffic. In the traffic-free area, the ozone concentration rises from a maximum between 5 and 6 a.m. to a maximum between 2 and 3 p.m. and gradually subsides again. In the busy Schlosstrasse, the ozone concentration drops to a minimum between 7 and 8 a.m. At this time, which coincides with the morning rush hour, the ozone concentration was just half as high as that in the traffic-free area.

978 APTIC NUMBER 12360

Massachusetts Dept. of Public Health, Boston, Air Use Management Program
SPECIAL REPORT ON THE INVESTIGATION AND STUDY OF AIR QUALITY IN THE METROPOLITAN (BOSTON) AIR POLLUTION CONTROL DISTRICT 1965-1966 UNDER CHAPTER 89 OF THE RESOLVES OF 1960. 141p., Sept. 16, 1968. 22 refs.

Atmospheric contamination in the Boston metropolitan area was intensively investigated by the Massacusetts Department of Public Health. The principle aims of the study were to determine the sources, extent, and nature of atmospheric contaminants in Boston and its surrounding communities; the variation in concentration of the contaminants with respect to time, location, topography, and meteorological variables; the effects of such pollution; the types, locations, and strengths of significant emission sources; and the requirements of a continuing program of atmospheric monitoring and air pollution control. All sampling measurements are presented in the form of tables and bar diagrams. Means for reducing the potential for occurrence of pollution levels of certain contaminants are discussed.

979 APTIC NUMBER 12130

McCaldin, Roy O. and Willis E. Bye
AIR POLLUTION APPRAISAL - SEWARD AND NEW FLORENCE, PENNSYLVANIA. Preprint, Robert A. Taft Sanitary Engineering Center Cincinnati, Ohio, 41p., 1961. 11 refs.

A joint health and air pollution study was conducted in Seward and New Florence, Pennsylvania, between September 1959 and April 1960. The air quality over Seward as compared with that over New Florence was determined. Seward (population 758) and New Florence (population 958) are about four miles apart in the Conemaugh River valley 50 miles east of Pittsburgh. Between them and near Seward, at Smokeless, Pa., there is a coal burning, steam-electric generating plant, and east of Seward there is a burning culm pile. Because of the proximity of these emission sources and because of prevailing winds, Seward is subject to higher pollution levels than New Florence. Air sampling was done from October 1959 through April 1960. The average sulfur dioxide value for Seward was 0.09 ppm as compared with less than 0.01 for New Florence. Total sulfur compounds were measured in both communities by the lead peroxide method, and Seward values were 6.2 times greater than those for New Florence. Three types of measurements were made for particulates. Dustfall was 3.2 times greater in Seward than New Florence. Suspended particulates, measured with high-volume samplers, were 1.4 times greater; and soiling, measured with filter tape samplers, was 1.5 times greater in Seward than New Florence. A vegetation survey in June 1960 disclosed sulfur dioxide injury to plants in and around Seward with no similar damage at New Florence. (Author summary modified)

980 APTIC NUMBER 18044

Munn, R. E., D. A. Thomas, and A. P. W. Cole
A STUDY OF SUSPENDED PARTICULATE AND IRON CONCENTRATIONS IN WINDSOR, CANADA. Atmos. Environ., 3(1):1-10, Jan. 1969.

A 56-day survey of suspended particulate and iron concentrations in the Windsor area is reported. The two pollutants show different spatial patterns due to the presence of very local sources of iron oxide. The differences are emphasized by prestratifying the data and selecting sub-classes of days when the wind direction was steady in particular sectors. Portable samplers and a bivane are used to obtain an order-of-magnitude estimate of the strength of the iron source. (Author's Abstract)

981 APTIC NUMBER 12147

Nader, John S.
CONTINUOUS GAS MONITORING OF URBAN AIR BY THE U.S.P.H.S. Preprint, Instrument Society of America, Pittsburgh, Pa., 9p., 1961. 7 refs. (Presented at the Instrument Society of America Instrument-Automation Conference, Los Angeles, Calif., Sept. 15, 1961.)

In September 1961, the U. S. Public Health Service initiated a program of continuous gas monitoring of urban air. Objectives of the program were to obtain information on the effects of gaseous emissions from auto exhaust on the health of persons in a large urban area and to determine optimum frequency sampling and duration of sampling intervals. Data was provided by stations in Chicago, Cincinnati, New Orleans, Philadelphia, San Francisco, Washington, D. C., Los Angeles, and Detroit. The stations were located as close as possible to the center of each city's business district; at each station, ambient air was sampled within 10 to 15 ft above ground level. Identical instrumentation has been selected for the cities to eliminate instrument difference as a varying parameter. Colorimetric analyzers are specified for nitri oxide, nitrogen dioxide, and total oxidants; conductometric for sulfur dioxide, coulometric for O3, infrared for carbon monoxide; and flame ionization for hydrocarbons. Analytical data obtained in monitoring are presented in the form of continous strip-chart recordings. To overcome the problem of handling strip-chart data, a digital punch-tape recorder has been incorporated with each strip-chart recorder.

982 APTIC NUMBER 17332

Odaira, Toshio
RESEARCH ON REGIONAL REPRESENTABILITY OF ATMOSPHERIC SO2 CONCENTRATIONS AT THE AIR POLLUTION MONITORING STATIONS IN TOKYO. (Tokyoto taikiosenkanshijo nickeru aryusangasu nodo no chiikidaihyosei nikansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 3(3):179-192, Dec. 1, 1969. 2 refs.

The regional representation of atmospheric sulfur dioxide concentrations measured at permanent air pollution monitoring stations was studied with electro-conductometric analyzers for one month at 7-10 temporary stations in the environs of the permanent stations. Sulfur dioxide concentrations at the permanent stations represented regions where the pattern of the daily variation is similar to the frequency distributions of SO2 concentrations at the temporary stations. There is a tendency for data from a permanent station to represent a large

region in the summer, and to represent a smaller region in the winter. There was also a tendency for data to be significant for a large area if the area was commercial and residential. When data was significant for a smaller area, pollutant sources were scattered in a factory area. Because SO2 concentrations vary from the heating season to the non-heating season in Tokyo, where the factory districts, business districts, and residential areas are scattered, it may be necessary to study pollution during both seasons. (Author abstract modified)

983 APTIC NUMBER 12350

Ogden, Eugene C., Gilbert S. Raynor, Janet V. Hayes, and Philip C. Walker
TRAVELS OF AIRBORNE POLLEN. New York State Museum and Science Service, Albany, Research Grant AP-81, PR-9, 27p., March 1969. 4 refs.

The testing and comparison of a Hirst spore trap, a rotorod sampler, titled filter holders, and an automatic grab sampler are reviewed. Procedures followed in studies of pollen dispersion from a line source of living plants and in a forest are summarized, as well as the development of a mathematical model for predicting concentrations resulting from multiple point sources. Average concentrations and diurnal patterns are given for Jack Pine pollen in a natural stand and ragweed pollen in a ragweed source-free area as recorded by the following samplers: intermitten rotoslide, modified rotoslide, sequential rotoslide, and Hirst spore trap.

984 APTIC NUMBER 12168

Pennsylvania Dept. of Health, Div. of Air Pollution Control
THE BEAVER VALLEY AIR POLLUTION STUDY. 62p., 196? (?). 7 refs.

Beaver Valley, Pennsylvania is located west of and adjacent to the foothills of the Allegheny mountains. The width of the valley, which is approximately 1200 miles above sea level, varies from one-half mile to about two miles. Steep mountain walls rise abruptly from the valley floor. As indicated by an air quality study of the region, an area-wide air pollution problem exists, attributable to the emission of coarse and fine particulates. This particulate matter emanates from an industrial and residential complex located in valleys created by the Beaver and Ohio Rivers. Levels of suspended particulates recorded in two boroughs are among the highest ever recorded in Pennsylvania. Analysis of particulate samples shows that the major air pollution sources are primary metallurgical plants and allied industries and industrial and domestic combustion of fuels, especially bituminous coal. Sulfur dioxide emissions are not an area-wide problem, but the contaminant is a localized problem in the vicinity of zinc smelters and large power plants. Hydrogen sulfide is a problem in the vicinity of a refinery and installations processing blast furnace slag. Air pollution problems are accentuated by topographical and climatological factors, such as nocturnal ground-level inversions. Contaminants emitted during these periods are not readily diluted because lateral diffusion is inhibited by the valley walls and vertical diffusion, by the ground level inversion layer.

985 APTIC NUMBER 17359

Petit, L. and J. Quere
RESULTS OF ATMOSPHERIC POLLUTION MEASUREMENTS TAKEN AT NANTES. (Resultats des mesure de la pollution atmospherique a Nantes). Text in French. Pollut. Atmos. (Paris), no. 44:181-186, Oct.-Dec. 1969. 2 refs.

Air pollution measurements in Nantes (France) were made in November 1965 using 5 sulfur dioxide and smoke sampling stations with daily readings. At present, there are 8 such stations in the city: at city hall, botanical garden, town hall of Chantenay, Graslin theater, laboratory of the hygiene department, civic center of the Pilctiere, Ripossiere school and Proce park. During the 37 1/2 months of operation, a total of 12,497 measurements were made, with a mean accuracy of about 3 micrograms/cu m of air. The total annual average SO2 content and smoke content were as follows: in 1966, 48 and 37; in 1967, 50 and 32; and in 1968, 46 and 37 micrograms/cu m, respectively. In view of the accuracy of the measurements, the above figures are essentially the same each year. The monthly averages show the strong seasonal variation of either pollutant. The weekly averages exhibit the same strong seasonal variations. In addition, they follow very closely the variation of the weekly average temperature for each year. Among the factors associated with air pollution are wind speeds, given in the form of a discrete wind-speed distribution during the 3-year period. A correlation between air pollution and consumption of fuel may exist, and available pertinent data are given.

986 APTIC NUMBER 12114

Reynolds, R. A., T. Teichman, and J. L. Monkman
THE HYDROCARBON CONTENT OF URBAN AIR - A SIX MONTH SURVEY. Preprint, Air Pollution Control Association, New York City, 28p., 1963. 6 refs. (Presented at the Air Pollution Control Association Annual Meeting, 56th, Detroit, Mich., June 9-13, 1963.)

Total hydrocarbon readings (calculated as methane) were obtained over a six-month period at selected locations in a laboratory building located in a semi-industrial area. The sampling positions were the air-conditioned main floor laboratory, hydrocarbon cylinder next to the analyzer, stairwell, fume hood exhaust on roof, powerhouse chimney on roof, and the penthouse roof. Procedures used in the operation of a Beckman analyzer, which incorporates a flame ionization detector, are detailed. Weekly total and weekly mean morning and afternoon hydrocarbon values for each sampling point were tabulated. The values for outside air, fume hood, staircase, and boiler room were essentially of the same order of magnitude. Mean values for outside air were 4.5 and 4.0 ppm, respectively, for morning and afternoon. Chimney values, as expected, were higher but not as high as laboratory values. The advantages of flame ionization detection for continuous air monitoring with or without prior gas chromatographic separation, are stressed.

987 APTIC NUMBER 17413

Saito, Isamu
AIR POLLUTION AT HITACHI DISTRICT IN IBARAGI PREFECTURE. (Ibaraqi-ken Hitachi-chiku no taikicsen ai tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 6(3):178-188, March 25, 1970. 7 refs.

Since World War II, significant changes have occurred in the character of air pollution in the Hitachi district of Ibaragi Pretecture. These changes are typical of the air pollution history of Japan. During the prewar period, sulfur dioxide was the predominant pollutant; but smoke-dust emissions from cement plants have become equally important in postwar years. Both categories of pollutants were collected by the deposit gauge method in field studied covering nearly four years. The studies show that the Hitachi Mining Company is also an important source of SO2 and dust. Variations in both average density level and monthly average of cement dusts are influenced by meteorlogical conditions, especially rain, wind speed, and wind direction. The tact that soluble ccmponents contained in scme dust occasionally exceeding the insoluble component, and that pollutants at some sites showed amounts of Ca(2+), neutral pH, or weak alkaline level is attributed to the cement constituent. The data derived from the study of the influence of rainfall on dust fall suggests that between 10% and 20% of the dust fall is due to rain. A deposit gauge is apparently less precise and reliable than a dust jar. A comparative study on both instruments indicates that the latter is better for determining collection rates, particularly of tar-bearing dusts. The maximum rate of Ca(2+) contained in a cement solution was 20% of the total cement input to the test solution.

988 APTIC NUMBER 11960

Seisaburo, Sekido, Kameda Kiyoko, and Nakagawa Tatsuko
FREE DUST PARTICLES AND AIRBORNE MICROFLORA. Osaka Shiritsu Daigaku Kaseigakubu Kiyo (Depts. of the Sci, of Living, Osaka City Univ.), 4(3):31-37, March 31, 1959. 7 refs. Translated from Japanese. 17p.

Summer measurements of free dust particles and airborne microflora in concrete apartments, Japanese-style wooden houses, and outside air in Toyonaka City are reported and compared with previously made winter measurements. Data on diurnal variations in dust density and bacteria count are presented and evaluated. A positive correlation between indoor and outdoor dust density is established. Airborne bacteria counts did not correlate with dust density and seemed essentially dependent upon the degree of human activity in the area.

989 APTIC NUMBER 17391

Simon, Conrad
NEW YORK CITY'S METEOROLOGY PROGRAM. Air Pollution Control Assoc., Pittsburgh, Proc. Air Pollution Control Assoc. Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Philadelphia, Pa., 1969, p. 6-23. 11 refs. (March 21.)

The scope, activities, and objectives of the meteorology program of New York City's Department of Air Resources are reviewed. The program includes monitoring, analysis, and management support activities. Monitoring is conducted by a ten-station telemetry network and is supplemented by local weather bureau and airways station observations. At each network station, sulfur dioxide, carbon monoxide, and smoke shade are measured automatically and continuously. The meteorological parameters are wind speed, wind direction, and air temperature. The measurements obtained provide the information required to meet the objectives of a sampling and analysis program. These objectives are as follows: to measure the distribution of pollution near the surface throughout New York City; to determine the long- or short-term effects of concentrations on health; to determine the relationships between ambient concentrations and air quality standards; to determine major emission sources; to determine the mechanisms responsible for pollution dispersion; to develop methods for predicting, on all time and space scales, the magnitude and extent of pollutant concentrations; and to set up a scheme for forecasting concentrations on a 24-hr basis. Diffusion and emission models being considered for automatic forecasting are discussed at length.

990 APTIC NUMBER 12141

Tabor, Elbert C. and Donald H. Fair
RELATION OF BENZENE SOLUBLE ORGANIC MATTER TO SUSPENDED PARTICULATE MATTER IN THE ATMOSPHERE. Preprint, Air Pollution Control Association, New York City, 20p., 1960. 2 refs. (Presented at the Air Pollution Control Association Annual Meeting, 53rd, Cincinnati, Ohio, May 22-26, 1960.)

The relationship between benzene soluble organic matter and suspended particulate matter in air particulate samples collected at 144 urban and 38 nonurban stations of the National Air Sampling Network during 1957 and 1958 were compared by arithmetic and geometric means and standard geometric deviations. National arithmetic mean values of the benzene soluble organic to suspended particulate ratio were .082 for urban stations and .084 for nonurban stations. The respective geometric values were .074 and .066. The arithmetic mean ratios for the New England, Mideast, Southeast, and Pacific Coast regions were higher than the national mean; those of the Mid Atlantic, Midwest, Great Plains, Gulf South, and Rocky Mountain regions were lower. The Great Plains and Pacific Coast regions had the highest standard geometric deviations. In seven of the eight regions covered, the nonurban stations showed higher standard geometric deviations than urban areas. Comparison of coastal station values with inland station values indicated no significant difference in mean values for the benzene soluble-particulate ratio, suggesting that nonurban pollution may be merely highly diluted urban pollution.

991 APTIC NUMBER 12107

Taylor, Worthen H.
SPRINGFIELD AIR POLLUTION SURVEY FEBRUARY 1963. Massachusetts Dept. of Public Health, Boston, Div. of Sanitary Engineering, 13p., March 1, 1964. 3 refs.

In a survey extending from February 4 to March 11, 1963, data on atmospheric pollution in Springfield, Massachusetts, was obtained at five sampling sites representing industrial, commercial-industrial, and residential areas. Atmospheric sulfur (reported as sulfur trioxide) was determined by lead peroxide candle samplers; suspended particulate matter, by high-volume samplers; and the degree of soiling produced by particulates, by tape stain samplers. The monthly average of sulfur compounds was lower than expected; average sulfur trioxide concentrations ranged from 0.6 to 0.95 mg/100 sq cm/day. Based on a comparison with past data for winter months in Springfield, suspended particulate loadings were also somewhat lower than anticipated. The average levels ranged from 80 to 120 micrograms per cu m air, indicating a condition of moderate pollution except along the river, where the levels were significantly higher. Levels of the staining power of particulates were light to moderate, showing only minor variations with time of day and from day to day.

992 APTIC NUMBER 17382

Tebbens, Bernard D.
INVESTIGATING AIR QUALITY IN ISTANBUL. Am. Ind. Hyg. Assoc. J., 31(1):44-51, Jan.-Feb. 1970. 5 refs.

A small group of fifth-year engineering students at Istanbul Technical University gathered the first data on air quality and pollution in Istanbul. Preliminary information was obtained on fuel usage and trends, particle fallout, meteorology, particulates, and sulfur dioxide concentrations. Actual monitoring was limited to about two months in the spring of 1968. All measurement results are presented in the form of tables. The greatest air pollution problem is represented by airborne particulates; the average daily concentrations during the sampling period ranged from 51 cu cm to 1050 cu cm. Average sulfur dioxide concentrations were 0.03 ppm. The very high dust fall and soot fall levels recorded compare with those of earlier years in the United States and reflect complete inattention to control of smoke and dust. It is possible that a gradual shift to the use of fuel oil in Istanbul will reduce particulate concentrations but increase sulfur dioxide concentrations, despite fairly constant year-around patterns of wind movement. Both of these trends need confirmation by long-term monitoring observation. (Author abstract modified)

993 APTIC NUMBER 12426

Vaughan, H. L. and G. B. Welsh
AIR POLLUTION EVALUATION. PASCAGOULA - MOSS POINT AREA OF MISSISSIPPI. Jackson County Health Dept., Miss., 15p., Feb. 1964. 5 refs.

A thirty day air pollution evaluation was undertaken in the Pascagoula-Moss Point area to determine the extent and magnitude of the air pollution problem and to obtain basic information on air pollution levels that may be useful as a reference point to indicate any significant changes that may occur in the future. The Pascagoula-Moss Point area is one of the most industrialized areas in Mississippi and has the potential for future industrial expansion. The air pollutant levels indicated that air pollution is not a serious problem at present, although hydrogen sulfide levels may be sufficient to cause lead base paint discoloration and odor complaints at times; the suspended particulate loading indicated a potential problem. It was pointed out that a short term evaluation can only provide a general indication of air pollution levels. Generally, the meteorological conditions in the Pascagoula-Moss Point area favor the dispersion and dilution of air pollution. However, periodic low-level inversions and stagnant air masses may occur. There are also indications that appreciable periods of calm-stagnant weather may occur which contributes to the accumulation of air pollution in the area. It was recommended that surveillance be maintained to indicate any significant changes in the air pollution problems of the area; that records of air pollution type complaints be maintained; and future evaluations be undertaken whenever there is an indication that the air pollution problem in the area may be significantly changed. (Author summary modified)

994 APTIC NUMBER 18043

Weisman, B., D. H. Matheson and S. Hirt
AIR POLLUTION SURVEY FOR HAMILTON, ONTARIO. Atmos. Environ., 3(1):11-23, Jan. 1969. 7 refs.

Hamilton, Ontario, Canada, is of considerable interest in pollution studies because of the influence of a well developed lake breeze in the summer, as well as the presence of an escarpment to the south of the central city rising to 300 ft. above the city and oriented almost parallel to the direction of the lake shore. The diurnal, weekly, seasonal, and annual pollution cycles are discussed. The annual cycle is shown to be strongly related to the degree-day criteria used by the oil companies to determine amount of fuel consumption. The influence of this heating factor associated with higher pollution in winter is removed, and the resulting smoke index is analyzed with respect to meteorological factors. (Author's Abstract)

995 APTIC NUMBER 17373

Wilson, Edward F. and William E. Belanger
WHEN YOU KNOW - WHAT'S IN THE AIR. Air Pollution Control Assoc., Pittsburgh, Proc. Air Pollution Control Assoc. Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Philadelphia, Pa., 1969, 1969, p. 96-106. (March 21.)

The concepts and objectives of Philadelphia's computerized air management information system are reviewed. Basic to the program is a value system and set of practical criteria allowing restatement of program goals in the light of new evidence. A minimum of necessary measurements can be determined from the value system. The system has been established in terms of reductions in specific pollutants, with a greater reduction given a higher value. Past approaches can be compared with the expected performance of other approaches. With respect to evaluating the 'real' pollution situation, six-hour and 24-hour running averages of pollutant levels are determined for each monitoring station. In the future, better estimates are expected by diffusion modeling and consideration of complex geographic variations. For the present, the control system model will be a simplified estimate of the effect of control actions and the weather. Within this context, and given short-term weather predictions, appropriate control measures can be deduced.

996 APTIC NUMBER 11699

Alkire, H. L.
AIR POLLUTION IN KENT COUNTY MARYLAND. Maryland State Department of Health, Baltimore, Div. of Air Quality Control, 11p., Dec. 1968. 9 refs.

Kent County, Md. is an agricultural and fishing area with an estimated population of 15,600. Its topography is comparatively level, with elevations generally 50-80 ft above seea level. The primary heating source is fuel oil. Characteristic light winds and frequent periods of atmospheric stability tend to increase the concentration of air pollutants. However, pollutants are quickly dispersed by vertical air currents. Moreover, the smallness and scatter of population, industry, and motor travel, the level terrain, and the influence of nearby water surfaces combine to indicate that significant amounts of air pollution are unlikely in the foreseeable future. Estimations of pollutants, as determined by comparison with areas where pollution measurements have been made, suggest that suspended particulate matter averages 50-70 micrograms per cu m of air with extreme one day measurements of 100-125 micrograms. Dust fall is thought to be under 10 tons/sq m/mo and sulfur dioxide 0.02 ppm or less during all months.

997 APTIC NUMBER 11635

Altshuller, A. P.
COMPOSITION AND REACTIONS OF POLLUTANTS IN COMMUNITY ATMOSPHERES. Bull. World Health Organ. (Geneva), 40(4):616-623, 1969. 26 refs.

Data are presented showing the composition of gaseous and particulate substances in community atmospheres, based on measurements in various cities in the United States. Many of the pollutants react further, usually to produce substances as undesirable as the original ones, or more so; most of these reactions involve thermal oxidation or photooxidation. Because of the importance of considering air pollution on a regional or even continental scale, a general framework of residence times of pollutants is postulated; up to several days under adverse conditions in many regions, but less than 24 hours across large urban areas under more usual conditions of wind speed and movements of weather fronts. Pollutants and other atmospheric substances are categorized as either reactants-those substances emitted directly into the atmosphere from combustion, industrial, and biosphere processes; or products such as nitrogen dioxide and sulfates. Some substances may fall into both groupings. Data are given on rates of various reactions, and the nature of the products is described. In general, the measurements showed 1% to 15% conversions of gaseous to particulate species on a long-term basis; rates of conversion of nitrogen dioxide to nitrate were consistently lower than those of sulfur dioxide to sulfate. Recent work on particle size distributions of various metallic and non-metallic ions in particulates in U. S. cities is reviewed, with data given in terms of mass median diameters. It is pointed out that the biosphere is a source of, as well as a sink for, pollutants, and that urban levels of methane or nitrous oxide, for example, reflect to a considerable extent biosphere, rather than urban, emissions. Reactions originating in biosphere processes may contribute significantly to regional pollution, particularly during periods of stagnation. The need for increased emphasis on atmospheric investigation, as opposed to laboratory work, and for improved sensitivity and specificity in monitoring and sampling is discussed.

998 APTIC NUMBER 12246

Anderson, R. V. and S. G. Gathman
MEASUREMENTS OF THE ELECTRICAL CHARACTERISTICS OF SNOWSTORMS. In: Report of NRL Progress. Naval Research Lab., Washington, D. C., p. 5-10, Feb. 1968. 4 refs.
CFSTI: PB 177570

Two series of measurements were conducted in which ground-based apparatus and an instrumented research aircraft were simultaneously employed to measure electrical phenomena associated with active snowstorms. Such measurements provided an opportunity to separate the effects of mechanically and electrically transported charge produced in the storm and an independent check on the data. Numerous effects such as blowing snow, cloud conditions, and low ambient temperatures were encountered which rendered the data collection difficult, but enough data were obtained to demonstrate agreement between ground and airborne measurements and to indicate the existence of a wide variety of electrical phenomena in snowstorms. The measurements yielded evidence of charged snowflakes of both polarities, pockets of charge within the snowclouds, and a wide range of total current fluxes to the earth. Snowstorms probably do not contribute to the charging of the global system, although the large dissipative currents sometimes observed could have a measurable role in the global picture. (Author abstract modified)

999 APTIC NUMBER 12352

Barry, P. J.
ESTIMATION OF DOWNWIND CONCENTRATION OF AIRBORNE EFFLUENTS DISCHARGED IN THE NEIGHBORHOOD OF BUILDINGS. Preprint, Atomic Energy of Canada Ltd., Chalk River, Ontario, 16p., 1963. 6 refs. (Presented to the Atomic Energy Control Board, Advisory Committee on the Safety of Particle Accelerators, Sept.)

The behavior of stack gases can be divided into two phases. In the aerodynamic phase, the behavior pattern is determined by the excess momentum and excess temperature of a particular discharge and by the shape and size of the stack. The second phase begins when the excesses of temperature and momentum have been dissipated at a downwind distance sufficient to eliminate the disturbance of air flow caused by the stack. The popular diffusion equations used to estimate the effects of atmospheric pollution apply only to the second phase. They do not apply very near to a stack or where the stack is surrounded by other buildings or topographic features of purely local significance. However, it is possible to generalize about air flow over cities, provided that the points of interest are sufficiently high above ground for those unique features that distinguish one city from another to be small. Under these conditions, a diffusion equation may be applicable if suitable parameters are used. Five practical

diffusion formulae are reviewed and reduced to a common form. It is noted that the formula most applicable to diffusion among buildings in a city is the least useful, since the parameters used are not easily measured.

1000 APTIC NUMBER 12204

Blackadar, A. K., P. E. Glass, and H. A. Panofsky
EFFECT OF STABILITY ON THE WIND PROFILE UNDER CONDITIONS OF INHOMOGENEOUS TERRAIN ROUGHNESS. Sandia Corp., Albuquerque, N. Mex., Symp. Theory Measurement Atmospheric Turbulence Diffusion Planetary Boundary Layer, Albuquerque, N. Mex., 1967, p. 107-116. 2 refs. (Dec. 5-7.)

Whenever a wind (in the atmospheric boundary layer) in equilibrium with a surface of a certain roughness passes onto a surface of different roughness, finite intervals in time and space are required for the wind to come into equilibrium with the new surface. The depth of the layer within which the air is undergoing horizontal acceleration increases with increasing distance downwind from the change of roughness under conditions of neutral stratification. For non-neutral conditions of stratification, a perturbation-type theory was developed to describe the effect of non-adiabatic lapse rates on the depth of the accelerated layer. Under conditions of continuity of stress, wind speed, and wind shear at the height of the top of the accelerating layer, the equations of motion are integrated through the accelerated layer. From this integral an expression for the change in the accelerated layer/the change in the reciprocal of the Monin length as a function of downwind distance from the change in roughness was obtained. The results of preliminary tests of the theory indicated a somewhat smaller effect of stability than that predicted in a theory suggested by Miyake as modified by Panofsky. Both theories predict an increase of the accelerated layer with increasing instability, other factors being equal. However, the effect of stability on the accelerated layer is so small and the scatter in presently available observations is so large that it is not yet possible to discriminate between the two theories. (Author abstract modified)

1001 APTIC NUMBER 12108

Briggs, Gary A.
A SMOKE PLUME RISE THEORY. Preprint, Weather Bureau, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., 29p., Aug. 1964. 30 refs.

A 'top hat' model of a plume was developed which assumed entrainment rate proportional to vertical velocity plus a term contributed by the inertial subrange of atmospheric turbulence. Rise was predicted for stable, neutral, and unstable conditions depending on whether buoyancy or momentum flux is dominant and on whether it is calm or windy. For a buoyant plume, a two-thirds power law of rise was predicted and shown to be in good agreement with data. Ultimate rise in a neutral atmosphere was approximately proportional to heat efflux and the inverse cube of wind speed, but no observations were available where this limit was reached. In a stable atmosphere the prediction that final rise is proportional to the minus one-third power of wind speed and potential temperature lapse rate was supported by limited data. (Author abstract modified)

1002 APTIC NUMBER 12317

Busch, Niels E., John A. Frizzola, and Irving A. Singer
THE MICROMETEOROLOGY OF THE TURBULENT FLOW FIELD IN THE ATMOSPHERIC SURFACE BOUNDARY LAYER. Acta Polytech. Scand. Phys. Nucl. Ser. no. 59, 45p., 1968. 44 refs.
CFSTI: PB 180792

The background and principles of the Monin-Obukhov similarity hypothesis are reviewed and the spectra of turbulent wind fluctuations discussed in order to encourage potential applications in such as fields as structural design, air pollution, and agriculture. The theory describes the height dependency of various turbulent flow-parameters in a thermally stratified surface boundary layer, and can be regarded as a dimensional analysis on certain assumptions. The friction velocity, the vertical temperature flux, and the buoyancy parameter are constant with height; when combined into a characteristic length, time, and temperature, they can be used as scaling parameters for the flow. The implications of the hypothesis are discussed. The similarity theory can be extended to the spectra of the three--dimensional velocity fluctuations by considering the turbulent energy spectra in the universal-equilibrium range and the turbulent energy budget. A recent analysis of spectral data taken under thermally neutral and unstable conditions is presented and compared with other analyses. When plotted in similarity co-ordinates, the spectra of the longitudinal velocity components show no sign of dependence on thermal stability. In contrast to results obtained elsewhere, the spectra from the lower and upper heights of observation (23 and 92 m) are in agreement with the similarity hypothesis whereas those from 46 m differ by a factor of 0.7 from the other spectra. Within the accuracy of measurement, the spectra of the vertical velocity component obey similarity theory for moderate thermal instability. The spectra of the lateral wind component are by far the most sensitive to changes in thermal stability and seem not to agree with similarity theories. Parameters other than those studied may greatly influence the shapes of the spectra. (Author abstract modified)

1003 APTIC NUMBER 11824

Calder, K.
THE MONIN-OBUKHOV RELATIONS FOR THE VERTICAL GRADIENTS OF MEAN VELOCITY AND TEMPERATURE IN THE SURFACE LAYER OF THE ATMOSPHERE. Army Biological Center, Frederick, Md., 8p., June 15, 1966.

The basic hypothesis of the classical Monin-Obukhov similarity theory is that in the horizontally homogeneous surface layer, the vertical gradients of mean velocity dV/dz, and (potential) temperature dT/dz, are uniquely determined by just five parameters (constant vertical momentum and heat fluxes, two molecular parameters, and a buoyancy parameter) and the height coordinate z. The similarity theory is further developed and the validity of applying it to other statistics of the surface turbulence,

particularly to the variances of the horizontal components of wind velocity is discussed. The theory involves a hypothesis even in the case of the velocity and temperature gradients. In the case of the variances of the horizontal velocity fluctuations, the assumption of horizontally homogeneous surface conditions imposes no restriction on their vertical variations and the latter could be quite arbitrary without in any way affecting the governing equations for velocity and temperature gradient. Under these circumstances it would be entirely fortuitous if the horizontal variances were uniquely determined by the same scaling parameters as are hypothesized for the gradients of velocity and temperature. Therefore, the previous conclusion is considered still valid that, although the relations derived for dV/dz and dT/dz could legitimately be regarded as consequences of the governing dynamical equations for the surface layer, the same would not be true for other statistical properties of the surface turbulence.

1004 APTIC NUMBER 12181

Carson, James E. and Donald F. Gatz
CHICAGO AIR POLLUTION METEOROLOGICAL STUDIES. In: Radiological Physics Division Annual Report July 1967 through June 1968. Argonne National Lab., Ill., p. 87-93, 1969. 13 refs.
CFSTI: ANL-7489

A program to acquire meteorological data for a computer model of sulfur dioxide levels over Chicago is described. At the present time, Chicago diffusion characteristics can only be inferred from measurements made in other places. Measurements to eliminate this information void are planned. The needed measurements fall into two categories: direct measurements of diffusion characteristics in tracer studies, and airborne measurements of important Chicago weather phenomena. The tracer studies will demonstrate the effect of different classes of pollution sources on the total Chicago pollution level and verify the statistically derived coupling coefficients under various weather conditions in the Chicago area. In a study of atmospheric stability, vertical variations in temperature will be measured from an instrumented helicopter and by sensors installed on tall buildings. The objectives of the helicopter program are to evaluate atmospheric and diffusion conditions, to relate observed upper air conditions to standard weather bureau surface and raiosonde observations, and to make possible predictions of dispersion parameters from standard weather bureau data. The apparent discrepancies in wind direction between Midway Airport and the Chicago Telemetered Air Monitoring (TAM) stations will also be investigated. The general goal of the statistical diffusion model is to develop a set of regression equations to predict SO2 concentrations for each TAM receptor site. Each set of equations will eventually cover all meteorological conditions which might occur at the receptor. For this purpose, methods of identifying air pollution regimes and selecting periods of similar weather conditions will be developed.

1005 APTIC NUMBER 12198

Changnon, Stanley A., Jr.
CLIMATOLOGY OF HOURLY OCCURRENCES OF SELECTED ATMOSPHERIC PHENOMENA IN ILLINOIS. Illinois State Water Surv. Circ. 93, 28p., 1968. 23 refs.
CFSTI: PB 179912

Climatological information pertaining to the hourly occurrences of glaze, sleet, snow, thunderstorms, hail, fog, and smoke was reported. Data from Moline, Springfield, and Evansville stations were selected for use. Because of the geographical positions, these stations provide data considered representative of certain climatic conditions in northern, central, and southern Illinois. The diurnal distribution at a point of icing conditions and snowfall, which frequently tend to occur in the same storm period, indicated the existence of significant areal variations within Illinois. The maximum and minimum times for icing conditions and snowfall were not in agreement with those for winter precipitation. The diurnal distributions of thunderstorm occurrences did not exhibit marked areal variations. All three areas of the state had a maximum in the 1900-2200 hr period, and a second maximum in the 0100-0400 hr period. This agreed fairly well with the diurnal distribution of precipitation in the warm season. Occurrences of damaging hail are at a maximum in the 1300-1900 hr period which is before the first thunderstorm maximum; but hail occurrences are at a minimum in the late morning hours when thunderstorms are least frequent. Fog, a hydrometeor, and smoke, a lithometeor, both of which produce visibility problems, also exhibit very little statewide variability in their diurnal distributions. Both phenomena are at a maximum in the midmorning hours and are at a minimum in the early afternoon. There was very little difference in the durations of sleet, thunder, and hail when they occur at a point anywhere in Illinois. However, the average point durations of glaze, snowfall, and fog varied slightly. Daily extreme of the seven atmospheric phenomena vary from no occurrences per day to 24 hours for fog and smoke. (Author summary modified)

1006 APTIC NUMBER 12336

Clarke, John F.
NOCTURNAL URBAN BOUNDARY LAYER OVER CINCINNATI, OHIO. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Air Resources Lab., 27p., Oct. 1968. 8 refs.

The nocturnal urban boundary layer in the Cincinnati metropolitan area was studied in 13 pre-dawn investigations. Surface temperature measurements were obtained from a sensor mounted on an automobile; vertical temperature distributions, from coordinated helicopter soundings along the automobile route; and wind velocities, from pilot ballon observations in urban and rural areas. A relatively unstable urban boundary layer developed as rural air flowed over Cincinnati. The boundary layer gradually increased in height with downwind distance from the city. Beyond the downwind side of the urban area, the relatively unstable air was found aloft over a stable surface layer, suggesting a layer of outflowing urban air aloft that is called the 'urban height plume.' When a strong inversion existed in the planetary boundary layer upwind from the city, the urban boundary layer was about 150-300 ft deep. A super-adiabatic lapse rate was observed within the urban boundary layer in the central business district and an isothermal lapse rate or weak inversion in the downwind suburban areas. A strong inversion, similar to that of the upwind rural environment was maintained above the urban boundary layer. (Author abstract modified)

1007 APTIC NUMBER 12223

Clements, Thomas, John F. Mann, Jr., Richard O. Stone, and James L. Eymann
A STUDY OF WINDBORNE SAND AND DUSTS IN DESERT AREAS. Southern California Univ., Los Angeles, Army Natick Labs., Mass. Proj. 7X83-01-008, TR-ES-8, 61p., Aug. 1963. 13 refs.
DDC: AD 417036

In desert areas of the southwestern United States, severe sand and dust storms occur at an average rate of less than two per year. Less severe storms average about four per year. Most storms occur in late winter or spring and last from one to three days. Storm incidence is higher in desert areas that have been disturbed by activities such as agriculture or large-scale military maneuvers. During a storm, sand and dust in significant amounts are carried at few miles at most; the usual distance is a few hundred or thousand feet. Wind-driven sand is carried mostly within two ft of the ground, with six ft as a maximum height in all but extremely high winds. Critical pickup velocities of winds vary according to the type of desert surface, the grain size and coherency of the surface materials, and whether or not the surface has been disturbed artificially. In dune areas, winds of 10 to 15 mph will initiate movement; on other sandy terrain, winds of 20 mph are required. Fine materials on desert flats will be set in motion at 20 to 25 mph, and on alluvial fans and playas, at 30 to 35 mph. No windblown material will be derived from desert pavements unless the surface has been broken. On all other desert surfaces, disturbances will lower critical pickup velocities by as much as 5 mph. (Author abstract modified)

1008 APTIC NUMBER 12405

Collins, Dave G. and Michael P. Wells
COMPARISON OF ATMOSPHERIC PATH RADIANCE CALCULATIONS FOR MODEL CLEAR AND HAZY ATMOSPHERES. Radiation Research Associates, Inc., Fort Worth Tex., OAR Contract F19628-67-C-0298, Proj. 7621, Task 762107, Unit 76210701, SR-5, AFCRL-68-048C, 26p., June 15, 1968. 7 refs.
CFSTI, DDC: AD 681122

The LITE-IV Monte Carlo Program was used to calculated ground reflectances and path radiances as a function of altitude and direction for a model atmosphere with a haze layer between the ground and an altitude of 3 km. Broad beam monodirectional monochromatic light sources ranging in wavelength from 0.35 to 0.95 micron were assumed incident to the model atmosphere at zenith angles ranging from 0 to 87.5 degrees. The atmosphere was assumed to be bounded on the lower surface by a Lambert type reflection surface having an albedo ranging from 0.0 to 0.9. The haze layer was defined by adding aerosols below three km altitudes to a model clear atmosphere so that the ground level meteorological range was reduced from 25 to 3 km. Several comparisons of the calculated ground reflectances and path radiances for the model hazy atmosphere were made with previously reported data for a model clear atmosphere illustrating some of the effects of adding a haze layer to the atmosphere. The effects of ground albedo, angles of observation, and angle of incidence on the calculated path radiances are shown for the inversion (hazy) atmosphere. (Author abstract modified)

1009 APTIC NUMBER 12188

Collins, Dave G.
STUDY OF POLARIZATION OF ATMOSPHERIC SCATTERED LIGHT USING MONTE CARLO METHODS. Radiation Research Associates, Inc., Fort Worth, Tex., OAR Contract F19628-67-C-0298, Proj. 7621, Task 762107, SR-2, RRA-T06, AFCRL-68-0310, 25p., May 31, 1968. 9 refs.
CFSTI, DDC: AD 675152

The effects of polarization on light scattered within pure Rayleigh and combined Rayleigh and aerosol atmospheres were studied with a modified version of the LITE-II Monte Carlo program. Routines treating both Rayleigh and aerosol scattering in the Monte Carlo procedure were modified in order to be able to compute each of the four Stokes parameters for atmospheric scattered light. The methods used to transform the Stokes parameters through the angle phi between the reference plane and the scattering plane were those given by Chandrasekhar for elliptically polarized light. From the computed values of the Stokes parameters, the degree of polarization of the scattered light intensity was obtained for each of several solid-angle intervals at a given receiver position. LITE-II calculations of the Stokes parameters Q, U, and I and the degree of polarization for Rayleigh atmospheres were compared with values of the same parameters reported by Coulson, Dave, and Sekera. The results of LITE-II calculations for an atmosphere containing aerosol particles were also compared with similar date from calculations reported by Fraser. The results of these comparisons indicated the validity of the methods incorporated for treating polarization due to both Rayleigh and aerosol scattering. (Author abstract modified)

1010 APTIC NUMBER 12208

Cornett, John S.
A STUDY OF WIND VARIABILITY IN THE LOWER TROPOSPHERE THROUGH POWER SPECTRUM ANALYSIS AT MESOSCALE FREQUENCIES. Sandia Corp., Albuquerque, N. Mex., Symp. Theory Measurement Atmospheric Turbulence Diffusion Planetary Boundary Layer, Albuquerque, N. Mex., 1967, p. 199-232. 12 refs. (Dec. 5-7.)

The wind variability produced by mesoscale perturbations was investigated. An attempt was made to relate these perturbations to known physical causes. The results were based on power spectrum analyses of wind data in the lower troposphere at Yucca Flat, Nevada and Cedar Hill, Texas. The data were obtained from a special 5-day series of radar-tracked balloon observations taken at 20-min intervals during the period from 27 January to 1 February, 1964. Simultaneous wind observations were also obtained from nearby Bren Tower at the 141-ft and 1500-ft levels. For comparative purposes, wind observations were also obtained from Bren Tower and Cedar Hill tower during other observation periods. An inspection of the spectral analyses from the Bren Tower and balloon data at the same level indicated that upper-air observations may be used to obtain valid estimates of the wind spectrum at low frequencies. Physically

real but minor peaks were found in the wind spectral band between 0.0625 and 15 cy/hr which are apparently associated with organized perturbations caused by the roughness of the terrain, cellular convection, and internal gravity waves. A comparison of the Bren Tower and Cedar Hill Tower direction spectra indicates good agreement in terms of well-defined maxima and minima between the two sites for frequencies from about 0.33 to 3 cy/hr. The power associated with the oscillations over the comparable frequency range differ considerably, however. These results seem to indicate that the physical phenomena responsible for the direction variance are common to both sites but differ in amplitude. (Author abstract modified)

1011 APTIC NUMBER 18026

Cramer, H. E.
METEOROLOGICAL INFLUENCES ON MILL EFFLUENT DISPERSION. Tappi, 52(6):1050-1054, June 1969. 12 refs.

Airborne waste products are diluted and transported by local wind circulations that are typically controlled by the meteorological structure and topographical features in the vicinity of the mill site. Quantitative estimates of effluent ground-level concentrations for various time periods can be obtained by solving semiempirical diffusion equations. Requisite input information for these equations includes source factors (type of effluent, rate and height of emission) and meteorological factors (mean wind speed, wind direction, intensity of turbulence, and the density stratification of the air within a large reference volume containing from 1 to 100 cubic miles of air). Routine assessment of the air pollution hazard posed by mill effluents requires a meteorological data system comprised of wind and temperature sensors, telemetry for transferring sensor outputs to a central collection point, and facilities for conditioning, recording, processing, and displaying meteorological information. The availability of small, general purpose digital computers makes fully automated data systems economically feasible for individual mill site installations. (Author's Abstract)

1012 APTIC NUMBER 11804

Dabberdt, Walter F.
TOWER-INDUCED ERRORS IN WIND PROFILE MEASUREMENTS. In: Studies on Effects of Boundary Modification in Problems of Small Area Meteorology. Wisconsin Univ., Madison, Dept. of Meteorology, Grant DA-AMC-28-043-66-G24, Task 1TC-14501-B53A-08, TR-ECOM 66-G24-4, p. 91-104, Feb. 1968. 7 refs.
CFSTI: RCS OSD-1366

The effect of a meteorological tower on the measurement of wind speed was investigated. Hourly vertical temperature and velocity profiles were obtained. A relative, rather than true wind direction was used. The wind data were averaged over 5 deg intervals and calculated as the ratio of the wind speed to a reference value. The speed of the outer, most upwind anemometer was used as the reference. Decreases in the wind speed up to 35% were noted downwind of the tower, with an increase up to 19% along the sides. The deficit region extended through an arc of approximately 60 deg and was well represented by a Gaussian distribution. Corrections of the wind speed based on this distribution reduced the error in a trial case. A slight dependence on atmospheric stability was detected. No effect of wind speed was observed.

1013 APTIC NUMBER 12363

Dana, M. T. and M. A. Wolf
EXPERIMENTAL STUDIES IN PRECIPITATION SCAVENGING. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II: Physical Sciences, Part 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 128-140, Oct. 1968. 8 refs.
CFSTI: BNWL - 715

The importance of submicron particles as carriers of fission products has stimulated research on the scavenging process. The present investigation is an extension of previous silver iodide scavenging tests which established the washout coefficient and characteristics of a submicron silver iodide aerosol and investigated the role of dry deposition in scavenging. Field tests with fluorescein aerosols were conducted in a variety of precipitation conditions with winds between 2 and 6 m/sec and rainfall rates between 1.5 and 8 mm/hr. The calculated washout coefficients for all tests were contrary to the scavenging theory but consistent with the indication of dry deposition of the silver iodide aerosol. Their values increased significantly with distance, presumably as the result of dry deposition. To determine whether the dry deposition values implied reasonable deposition velocities, an arc-integrated, dry-deposited mass was compared with exposure theoretically determined from meteorological data and diffusion theory. The mean values of experimental and theoretical deposition velocities were found to be within a factor of two of the depostion value of 5 cm/sec, considered appropriate for a surface acting as a 'perfect sink.' Retention of soluble fluorescein on a wet surface should provide such a condition.

1014 APTIC NUMBER 12393

Dana, M. T.
STUDIES OF PRECIPITATION ELECTRICAL CHARGE. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II: Physical Sciences, Part 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 140-149, Oct. 1968. 10 refs.
CFSTI: BNWL - 715

Field observations of precipitation electrical charges were recorded by a raindrop charge spectrometer at the Meteorological Tower at Hanford and at precipitation scavenging field experimental sites at Skyomish and Quillayute, Washington. Supplemental meteorological measurements were provided by a fast rainfall rate recording instrument, by oxalid paper exposures to rain (for raindrop size), and by a three-component wind instrument. At Quillayute, surface and upper air data were drawn from weather station records. Charges on individual raindrops were recorded at all three locations and snowflake charges were recorded at Skykomish. Samples of about 200 pulses each from the recorded raindrop charges were plotted as

statistical distributions. The distributions were approximately Gaussian in shape, with a peak somewhat near zero charge. With most samples, an apparent dip near zero was indicative of the limitation of the spectrometer in measuring small charges. On one occasion maximum sensitivity was attained, and the dip was not present. This case supports the assumption that near-zero magnitudes fit into the general trend of the distribution. With few exceptions, distributions peaked on the positive side. The average charge was found to increase with rainfall, although the dependency is a complicated function of the total characteristics of a particular storm or locale. Qualitative examination of the snow charge pulses indicated that they are predominantly negative, but with magnitude similar to those of the raindrops. The magnitudes appear to have a mean charge near zero.

1015 APTIC NUMBER 17372

Davis, Francis K.
AIR POLLUTION AND WEATHER. Air Pollution Control Assoc., Pittsburgh, Proc. Air Pollution Control Assoc. Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Philadelphia, Pa., 1969, p. 1-5. 1 ref.

Meteorological factors of primary concern in air pollution are wind direction, wind speed, change of wind with height (or wind shear), change of temperature with height (or temperature lapse rate), and precipitation. The wind direction is important in determining the source and direction of pollutants; it may also serve as an indicator of the diluting power of the atmosphere. The wind speed indicates the extent of the area that will be affected in a given time by a pollution source. The higher the wind velocity, the greater the intensity of turbulent diffusion and the lower the ground-level concentration of pollutants. The greater the change in speed with height, and the greater the change in direction with height, the greater the diffusion of contaminants and the lower the ground concentration at any point. When the temperature decreases rapidly with height, surface air tends to rise and to disperse pollutants to high levels. When the temperature increases with height, mixing is strongly inhibited and ground-level concentrations of pollutants increase. The effect of precipitation is to always increase the concentration of contaminants near the ground and to increase the pollution nuisance. Precipitation is especially important in relation to stability and wind conditions.

1016 APTIC NUMBER 18054

DeLuisi, J. J.
A STUDY OF THE EFFECT OF HAZE UPON UMKEHR MEASUREMENTS. Quart. J. Roy. Meteorol. Soc., 95(403):181-187, Jan. 1969. 13 refs.

The effect of atmospheric haze upon Umkehr observations is calculated in two ways. First, observed Umkehr curves are compared with computed Umkehr curves reconstructed from simultaneous direct soundings of the vertical ozone distribution. The difference between the two curves gives the 'experimental' haze effect. In the second method, Umkehr curves are computed for model atmospheres with and without haze the difference giving a 'theoretical' haze effect. When the two haze-effect curves are normalized to zero for a solar zenith angle of 60 degrees, both exhibit the same characteristics, viz., the 'correction' to be subtracted from an observed (with haze) curve is negative at all solar zenith angles, the correction reaches a maximum near 81 degrees, and there is a second small reversal near 87-88 degrees. Application of the derived haze corrections in the Umkehr evaluation procedure results in slightly higher O3 content at and just below the main maximum and slightly lower O3 content elsewhere. (Author's Summary)

1017 APTIC NUMBER 11764

Dilts, R. L., L. H. Robinson, and H. E. Ghilarducci
TOXIC EXHAUST CLOUD DIFFUSION STUDY. Aerojet-General Corp., Sacramento, Calif., Contract AF 04(611)-11623, AFRPL-TR-67-115, 74p., May 1967. 12 refs.
CDC: AD 816801

A field study of exhaust diffusion from solid rocket motors was conducted at the Aerojet-General Lovelock, Nevada, Facility. The primary objective of the program was to correlate the diffusion of puff-type rocket motor exhaust clouds with measurable meteorological variables under stable atmospheric conditions. Two sets of field data were collected from 413 air samplers used during the static tests of rocket motors containing a nominal 2100 lb of beryllium propellant. The difference in the values of the predicted versus is presented. The results from this exposure data were much lower than anticipated and indicate a significant mass loss. The most probable explanation is that the exhaust clouds penetrated the shallow inversions defined by the upper air temperature profiles. Consequently, a large percentage of the tracer particles could not penetrate the bottom lid of the inversion to return to the ground as the clouds diffused. This explains the mass loss although particle deposition could also be involved. Since the study was limited to two sets of field data, specific correlation of exhaust cloud diffusion with measurable meteorological variables could not be attempted. (Author abstract modified)

1018 APTIC NUMBER 11944

Efendi-zade, M. M. and B. M. Shteyngart
PRECIPITATING AEROSOLS IN THE AIR OF THE CITY OF BAKU AND THEIR SANITARY-HYGIENIC SIGNIFICANCE. Azerb. Med. Zh., no 1:67-71, 1955. Translated from Russian. 8p.

Data on the distribution of aerosols in Baku, USSR, their organic and inorganic components, and dust particle size were gathered in a five-year study. An analysis of the data showed uneven distribution of air pollution by months. The winter months gave a minimal quantity of aerosols; the summer and spring months were characterized by higher pollution indices. Distribution of aerosols within the city varied according to region: it was lowest in the area of most abundant vegetation and highest in a hilly part of the city subjected to the effect of northerly winds. The highest percent of organic substances occurred not in the aerosols from the industrial region but in the aerosols of the green area. The size of the precipitating aerosols was influenced by air temperature and wind velocity but not by relative humidity.

Between 1948 and 1952, there was a 72.5% decrease in the average monthly quantity of precipitating aerosols. This reduction is related to improvements in sanitary conditions, reconstruction, paving of streets and squares, increased vegetation, and the regular wetting of the streets in summer.

1019 APTIC NUMBER 12368

Elderkin, C. E.
ATMOSPHERIC TURBULENCE STUDIES. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II: Physical Sciences, Part. 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 109-113, Oct. 1968. 5 refs.
CFSTI: BNWL - 715

The turbulence studies reported were directed toward continued measurement of turbulence in the atmospheric boundary layer and toward formulating a model describing the diabatic effects on spectral shapes and shifts for all stabilities. Measured spectra are compared with the magnitude of spectral shapes and shifts. The magnitude of spectral estimates in the inertial subrange, anticipated from Kolmogrov's expression, is compared with the dissipation rate obtained from the turbulent energy budget equation where diabatic effects are estimated from wind and temperature profiles. A manner of normalizing and organizing the spectra is presented.

1020 APTIC NUMBER 12222

Elliott, William P. and Morton L. Barad
OPERATIONAL PREDICTION OF DIFFUSION DOWNWIND FROM LINE SOURCES. Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass., Meteorology Lab., Proj. 7655, AFCRL-64-163, Air Force Surveys in Geophysics no. 156, 56p., March 1964. 7 refs.
DDC: AFCRL-64-163

Graphs of expected dosage from an infinite line source are presented for various wind speeds, heights of release, and stability conditions. The graphs are based on Sutton's diffusion equation with parameters derived from Project Prairie Grass data. A method of estimating the range of validity of these equations for a line source of finite length is also presented. (Author abstract modified)

1021 APTIC NUMBER 12205

Frenzen, Paul
ON MEASURING VERTICAL FLUXES OF MOMENTUM AND HEAT WITH CUP ANEMOMETERS. Preprint, Sandia Corp., Albuquerque, N. Mex., p. 118-124, 1967. 6 refs. (Presented at the Symposium on the Theory and Measurement of Atmospheric Turbulence and Diffusion in the Planetary Boundary Layer, Albuquerque, N. Mex., Dec. 5-7, 1967.)

Simultaneous measurement of turbulence dissipation rates at two elevations is shown to be sufficient to determine the vertical momentum flux without appeal to either profile measurements or prior knowledge of surface roughness. It is also indicated that heat flux can be similarly evaluated; but in this application, requirements of site uniformity and observation accuracy are more severe. Results of preliminary field trials in which dissipation values were derived from data recorded by fast-response cup anemometers are described. (Author abstract modified)

1022 APTIC NUMBER 17387

Glasson, William A. and Charles S. Tuesday
HYDROCARBON REACTIVITY AND THE KINETICS OF THE ATMOSPHERIC PHOTOOXIDATION OF NITRIC OXIDE. J. Air Pollution Control Assoc., 20(4):239-243, April 1970. 9 refs.

The reactivity in the atmospheric photooxidation of nitric oxide has recently been determined for a large number of hydrocarbons. To aid in the application of these hydrocarbon reactivity measurements, the kinetics of the atmospheric oxidation were studied. The hydrocarbons investigated covered a wide range of reactivities and structures and included 2,3-dimethyl-2-butene, 2-methyl-2-butene, 2-methyl-1-pentene, propylene, mesitylene, o-xylene, and n-hexane. The rate of nitric oxide photooxidation increased less than linearly with hydrocarbon concentration for all the hydrocarbons studied. The degree of nonlinearity varied, however, with hydrocarbon structure and reactivity. The effect of the nitric oxide and the nitrogen dioxide concentrations on the rate of nitric oxide photooxidation also depended on hydrocarbon structure and reactivity. For all the hydrocarbons studied, however, the nitric oxide photooxidation rate increased linearly with increased light intensity. The effect of complex hydrocarbon mixtures on the rate of nitric oxide photooxidation was investigated using three commercial gasolines. The photooxidation rates measured for these mixtures agreed within experimental error with calculated rates based on chromatographic analyses of the gasolines and the reactivity in nitric oxide photooxidation of the individual hydrocarbons in the gasolines. (Author abstract modified)

1023 APTIC NUMBER 18010

Goldsmith, J. R.
LOS ANGELES SMOG. Science J., 5(3):44-49, March 1969.

The Los Angeles smog results from the reaction in the sunlit atmosphere of hydrocarbons and oxides of nitrogen, emitted mostly from automobiles. It differs from the dominant type of air pollution in the United Kingdom by occurring more in hot, dry weather than in cold, wet weather, being oxidizing rather than reducing, being related to motor vehicle exhaust rather than household heating. The components of Los Angeles smog and their sources are summarized. The atmospheric reactions of hydrocarbons and oxides of nitrogen in sunlight are discussed. Among the effects of photochemical smog are eye and respiratory irritation, vegetation damage, and reduced visibility.

1024 APTIC NUMBER 11634

Grimm, Elke
RELATIONSHIP BETWEEN THE GUSTINESS FACTOR AND THE TURBULENCE SPECTRUM. (Zusammenhang zwischen Boeigkeitsgroessen und Turbulenzspektrum). Scientific Rept. 1, T-748-I-203, March 31, 1968. 16 refs. Translated from German, Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 63p.

Parameters of atmospheric turbulence are of great importance in practical applications, since they make possible a description of atmospheric turbulence by simplifying variables. Expected values for gustiness factors as functions of the turbulence spectrum were presented, based on the statistical theory developed by S. O. Rice. Turbulence spectra were calculated from wind registrations by the Blackman-Tukey method. By using a filter, the variable observation times and moving average times were taken into account. The expected values for the gustiness factor, as determined by turbulence spectra, were compared with the evaluation of wind registrations. Agreement was satisfactory. (Author abstract modified)

1025 APTIC NUMBER 12342

Halitsky, James and Edward J. Kaplin
TRANSVERSE JET PLUMES. (TECHNICAL PROGRESS REPORT). New York Univ., N. Y., Geophysical Sciences Lab., AEC Contract AT(30-1)-3673, AEC Rept. NYO 3673-3, NYU Rept. GSL TR-68-13, 35p., 1969. 2 refs.

The equipment and procedures constituting two phases of a transverse jet plume research program are described. The first phase comprises field experiments requiring simultaneous measurement of plume concentrations at a sufficient number of locations to develop a three-dimensional, 30-min mean concentration distribution in each of several plume configurations. This phase uses a sulfur dioxide gas tracer injection system. The second phase involves a wind tunnel for measuring plume concentrations from a single stack normal to the wind in a low-turbulence air stream. The results of exploratory plume tests are presented, and laboratory experiments conducted to determine the accuracy of the proposed sample analysis procedure are reviewed.

1026 APTIC NUMBER 12398

Hansen, Frank V. and Gary A. Ethridge
DIFFUSION NOMOGRAMS AND TABLES FOR ROCKET PROPELLANTS AND COMBUSTION BY-PRODUCTS. White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., Task 1T014501B53A-10, ECOM-5171, 32p., Jan. 1968. 2 refs.
CFSTI,DDC: AD 680178

Information pertaining to travel distances from a continuous point source of toxic vapors associated with highly reactive rocket propellants or the by-products of combustion were presented in tabular and graphical form. The travel distance nomograms and tables for various compounds were developed using an empirical diffusion model originally developed by Miller and Miller. The empirical model is generally valid over a varity of quasi-homogeneous terrains and yields results which are considered reliable within a factor of 2 to 4. The nomograms and tables for twelve rocket propellants and a combustion by-product may be used to estimate the hazard corridors associated with toxic vapors from the chemical compounds. The rocket propellants were aniline, chlorine trifluoride, ethylene oxide, fluorine, hydrazine, hydrogen fluoride, hydrogen peroxide, fuming nitric acid, pentaborane, perchloryl fluoride, propyl nitrate, and unsymmetrical dimethylhydrazine.

1027 APTIC NUMBER 11980

Hasek, Milan
ON THE PROBLEM OF TRANSPORT AND DISPERSION OF GASEOUS HARMFUL SUBSTANCES FROM BIG THERMAL POWER PLANTS IN FLAT TERRAIN. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly Ash From the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 55-60.

Aspects of the mathematical solution of the transport and dispersion of gaseous pollutants from large-scale stationary sources are discussed, with emphasis on the special cases of fumigation, reflection, inversion, or condensation of smoke emissions from such sources. The Hewson formula, which is specific for reflection of smoke from bulk sources, is reviewed. The elaboration of relationships between the various emission, meteorological, and diffusion parameters is necessary to determine a methodology for meteorological data collection prior to construction of industrial plants in 'unknown' terrain. The determination of turbulent parameters for calculating pollutant concentrations is a difficult problem because of the lack of suitable equipment, in which case substitute data of more easily-measured variables are sometimes substituted. Appropriate theoretical treatment is outlined of wind velocity, variability of wind direction, and stack height factors.

1028 APTIC NUMBER 12365

Hinds, W. T.
DIFFUSION OVER COASTAL MOUNTAINS OF SOUTHERN CALIFORNIA. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II: Physical Sciences, Part 3. Atmospheric Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 19-53, Oct. 1968. 10 refs.
CFSTI: BNWL - 715

Data on diffusion over a mountainous area was gathered at Vandenberg Air Force Base during 1965 and 1966 in a program using zinc sulfide tracers released through insecticidal foggers. The nozzles of the foggers were aimed at a common point to provide a point source with an effective source height of about two to six m. The sample assay technique used was the scintillation counting of alpha particle bombardment of the zinc sulfide particles. Meteorological data were gathered by three systems: source point wind vector and temperature soundings; outlying wind vector measurements; and radiosonde

releases at hourly intervals. Techniques for estimating plume width were developed, a diffusion equation was derived, and the influence of terrain on plume geometry was studied. The most striking characteristic of the tests was the appearance of disjointed plumes due to the intervention of deep and steep canyons between the mountain ridges. The effect of the canyons of plume geometry was one-sided in that exposures along the floor were never higher than the upwind ridge; the tracer did not collect in the relatively stagnant air of the canyon floor to produce high exposures. A comparision of the data with that obtained from tests on flat terrain show that exposures in the mountainous area are highest during winter nights, exposures in the flat terrain are highest during summer nights. This indicates that local aspects of terrain and climatology can be expected to yield significant differences between regions in nighttime diffusion. In contrast, local climate conditions did not markedly affect diffusion during the day.

1029 APTIC NUMBER 12206

Horn, J. D.
STRUCTURAL-INDUCED INTERFERENCE ON WIND SENSOR MEASUREMENTS.
Preprint, Sandia Corp., Albuquerque, N. Mex., p. 125-142, 1968.
25 refs. (Presented at Symposium on the Theory and Measurement of Atmospheric Turbulence and Diffusion in the Planetary Boundary Layer, Albuquerque, N. Mex., Dec. 5-7, 1967.)

Airflow measurement errors are discussed in terms of interference effects created by obstacles in the flow field. Simulation experiments are described that give quantitative results for wind defect phenomena in the wake of three types of structures. The term wind defect describes the decrease in wind speed produced by a disturbing element in the fluid flow field. Wind defect amounts near 40% were measured in the lee of a tower model and still higher values were observed in the near distance behind building and cylinder models. The general character of the downstream wake behind obstacle models of varying geometry employed in this study is one of a turbulent flow regime that persists for many diameters with a strongly marked wind defect within a few obstacle diameters of the source. With respect to wind defect phenomena, one can expect major induced perturbations in the wind flow in the atmosphere to occur within a few diameters of an obstacle, a conclusion which is supported by the results of several investigators. Effects are at a maximum near the center of the wake and tend to decrease rapidly both laterally and with increasing height above the obstacle perturbation source. In general, defect phenomena measured in the simulation experiments are quite intense in the near distance behind an obstacle. While wind defects decrease measurably with downstream distance, turbulent vortices created in the wake tend to decay more slowly and may be observed at considerable distances downstream of the source.

1030 APTIC NUMBER 11031

Hoult, David P., James A. Fay, and Larry J. Forney
A THEORY OF PLUME RISE COMPARED TO FIELD OBSERVATIONS.
Massachusetts Inst. of Tech., Cambridge, Fluid Mechanics Lab., Pub. 68-2., 27p., March 1968. 12 refs.
CFSTI: PB 179536

A theory for the rise of a plume in a horizontal wind is proposed which assumes that, for some distance downwind of a high stack, the effects of atmospheric turbulence may be ignored in comparison with the effects of turbulence generated by the plume. The theory has two empirical parameters which measure the rate surrounding fluid entrained in the plume. The empirical parameters were evaluated in laboratory measurements of buoyant plume motion in laminar unstratified cross flow. The determinations made possible the predictions of trajectories of atmospheric plumes. In making the predictions, the observed wind velocity and temperature as a function at altitude, and flow conditions at the stack orifice were used the numerical integration of the equations. The resulting trajectories were compared with photographs of plumes at 500- and 600-ft high stacks. Within 10 stack heights downwind of the stack, the root mean square discrepancy between the observed height of the trajectory above ground level and the theoretical value was 14%, or about the uncertainty of the observed height. The maximum plume rise within the field of observation was found to be closer to the empirical effective stack height formula. (Author abstract modified)

1031 APTIC NUMBER 12235

Hoult, David P., James A. Fay, and Larry J. Forney
A THEORY OF PLUME RISE COMPARED TO FIELD OBSERVATIONS.
Massachusetts Inst. of Tech., Cambridge, Fluid Mechanics Lab., Pub. 68-2., 27p., March 1968. 12 refs.
CFSTI: PB 179536

A theory for the rise of a plume in a horizontal wind is proposed which assumes that, for some distance downwind of a high stack, the effects of atmospheric turbulence may be ignored in comparison with the effects of turbulence generated by the plume. The theory has two empirical parameters which measure the rate surrounding fluid entrained in the plume. The empirical parameters were evaluated in laboratory measurements of buoyant plume motion in laminar unstratified cross flow. The determinations made possible the predictions of trajectories of atmospheric plumes. In making the predictions, the observed wind velocity and temperature as a function at altidude, and flow conditions at the stack orifice were used the numerical integration of the equations. The resulting trajectories were compared with photographs of plumes at 500- and 600-ft high stacks. Within 10 stack heights downwind of the stack, the root mean square discrepancy between the observed height of the trajectory above ground level and the theoretical value was 14%, or about the uncertainty of the observed height. The maximum plume rise within the field of observation was found to be closer to the empirical effective stack height formula. (Author abstract modified)

1032 APTIC NUMBER 11956

Ito, Shozo
TURBULENT DIFFUSION IN THE ATMOSPHERIC BOUNDARY LAYER WITH STABLE THERMAL STRATIFICATION. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), vol. 1:18-23, 1966. 6 refs. Translated from Japanese. 22p.

An attempt is made to develop a theory for predicting the growth in the thickness of a cloud which is diffusing in a leeward direction from a continuous point source. Neutral stratification is contrasted with nocturnal thermal stratification. With respect to leeward axial concentration and the thickness of a cloud adjacent to the earth's surface, the theory is compared with diffusion data obtained in experiments conducted on a flat topography. (Author abstract modified)

1033 APTIC NUMBER 11628

Klug, W.
A METHOD TO DETERMINE CONDITIONS OF DIFFUSION FROM SYNOPTIC OBSERVATIONS. (Ein Verfahren zur Bestimmung der Ausbreitungsbedingungen aus synoptischen Beobachtungen). Preprint, Technische Hochschule, Darmstadt (West Germany), Institut fuer Meteorologie, 1967 (?). 11 refs. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 26p.

Although the best indicators of diffusion conditions can be obtained from long-term, frequent turbulence measurements at various altitudes and long-term vertical temperature gradient data, such measurements are not readily available; thus, the less ideal technique of using synoptic data must be used. A method is suggested, based on earlier methods, which permits correlation of synoptic data and diffusion conditions, thus implicitly comprising a correlation between synoptic observations and thermal stability; between the latter and the degree of turbulence in horizontal and vertical directions in the diffusing layer; and finally between this turbulence and the conditions of diffusion. The parameters necessary to determine thermal stability are date and time, cloud observations, and wind velocity on the anemometer level; from these and several additional measures, the second and third relationships can be determined. Classes of diffusion are established, with a distinction made between day and night. The diffusion parameters sigma-y and sigma-z, functions of the distance from the source and the class of diffusion, are developed at length. Comparison by computer of frequency distributions in the individual classes indicate that the method described here yields a more uniform distribution into these classes and avoids the undesirable effects of earlier methods. These calculations have application to such air pollution problems as determination of minimum chimney heights.

1034 APTIC NUMBER 16889

Kuhn, William P., and Julius London
INFRARED RADIATIVE COOLING IN THE MIDDLE ATMOSPHERE (30-110 km). J. Atmospheric Sci., 26(2):189-204, March 1969. 50 refs.

The infrared contributions to the heat budget by the 15micron CO2, 9.6micron O3, and 80micron H2O bands are evaluated for the upper stratosphere, mesosphere, and lower thermosphere as a function of latitude for both summer and winter. Flux divergences are numerically evaluated for a quasi-random band model with the appropriate line-broadening mechanism. A general discussion of the source function applicable to a multi-vibrational level molecule is given, and this formulation is applied to the 15 micron band of carbon dioxide. The flux divergence of infrared radiation acts to cool the atmosphere in the 30-110 km height region except in the vicinity of the mesopause. Here there is a small, but nevertheless significant heating which increases in value toward the summer pole (approximately 4K per day). Centers of cooling appear near the stratopause for low latitudes (approximately 10K per day) and in the lower thermosphere over the winter pole. Thermospheric values may vary by a factor of 4 because of uncertainties in the collisional lifetime of the 15micron transition, parameters have been developed for the rates of temperature change in this region in terms of the collisional and the radiative rates. Ozone makes a significant contribution to the cooling in the vicinity of the stratopause (approximately 3K per day). The water vapor contribution is approximately 1K per day for a mixing ratio of 10 to the minus 6 gm/gm. Our calculations indicate that both these gases, when compared with carbon dioxide, give a negligible contribution to the flux divergence in the upper mesosphere. (Author's Abstract)

1035 APTIC NUMBER 12209

Lettau, H.
A NEW TURBULENT-TRANSFER THEORY BASED ON EULERIAN CONCEPTS OF EDDY DISPLACEMENT STRUCTURE. Sandia Corp., Albuquerque, N. Mex., Symp. Theory Measurement Atmospheric Turbulence Diffusion Planetary Boundary Layer, Albuquerque, N. Mex., 1967, p. 240-257. 11 refs. (Dec. 5-7.)
CPSTI: SC-M-68-19

Deficiencies of the classical model of gradient-type eddy diffusion are outlined, including 'negative' eddy diffusivity for heat and failure to explain root-mean-square fluctuations in cases of vanishing mean gradient. New turbulent departure equations are derived from first principles of fluid dynamics, i.e., the Navier-Stokes equation and the universal conservation principle for a scalar property of the fluid. Certain oversimplifications of the classical theory are contrasted with legitimate simplifications. A new turbulent transfer theory is developed based essentially on a three-dimensional vector of eddy displacements. Eulerian three-dimensional turbulence statistics are outlined, with special consideration given to unidirectional mean shear flow. It is shown that major shortcomings of the classical model can be avoided. (Author abstract modified)

1036 APTIC NUMBER 12105

Levine, Myron
ATMOSPHERIC CHEMICAL REACTIONS-AIR POLLUTION. Lockheed Aircraft Corp., Burbank, Calif., Rept. 15055, 45p., Feb. 17, 1961. 37 refs.

The smog process in the Los Angeles Basin is summarized and the reduction of ozone by iodine is proposed. As determined in an aluminum-covered reaction chamber, the thermal decay rates of ozone at 54-119 F are 0.53 to 1.59 times 0.001 reciprocal min. The decay is a first-order surface-catalyzed reaction having an activation energy of 5.2 kcal. In dark and in sunlight, iodine reacts with ozone in purified air with an O3:I2 ratio of about

4.51, which is equivalent to that required for the formation of iodous iodate. The reaction rate in sunlight is faster than in the dark, probably because of the increased dissociation by photoenergy of the iodine molecule to energetic iodine atoms prior to the reaction with ozone. In a photochemical smog atmosphere, iodine reacts to reduce the ozone concentration by an O3:I2 ratio of approximately 7:1. It is postulated that the increased effectiveness of the iodine in reducing ozone in smog atmosphere over that in purified air is the result of the quenching by the iodine of the free radical chain which generates ozone. (Author summary modified)

1037 APTIC NUMBER 11927

Lindackers, K, H., H. Bresser, and J. Albracht
SOME THEORETICAL AND EXPERIMENTAL RESULTS USEFUL FOR ESTIMATION OF INHALATION RADIATION DOSE AND ENVIRONMENTAL RADIOACTIVE CONTAMINATION. In: Intern. Symp. Fission Prod. Release Transport Under Accident Conditions Oak Ridge, Tenn., April 1965, p. 362-380. 13 refs.

Estimations of inhalation radiation dose and environmental radioactive contamination due to the accidental release of fission products to the atmosphere depend on the calculation of the concentration of fission products in the atmosphere. Formulas adequate for this purpose were obtained by modifying the Sutton dispersion and Gaussian interpolation formulas. Ground concentrations calculated by both methods were compared; using the results of routine meteorological observations, the dispersion coefficients of the modified Sutton formula were calculated with experimentally verified correlations. The concentration values computed with both methods are in good agreement. Using a model of multiple reflections, ground concentrations were calculated under conditions of strong inversion at given heights above the emission source. The results for different heights above the source and various stability conditions are compared with results obtained by other authors. From measurements made over a period of several months, deposition velocities of fission products were calculated as a function of ground-level concentration and the amount of rain per time interval. The respective values correspond well with comparable values from other authors.

1038 APTIC NUMBER 12302

McElroy, James L. and Francis Pooler, Jr.
ST. LOUIS DISPERSION STUDY. VOLUME II - ANALYSIS. National Air Pollution Control Administration, Arlington, Va., Div. of Meteorology, NAPCA Pub. AP-53, 51p., Dec. 1968. 24 refs.

The primary analyses performed on data collected during low-level tracer experiments conducted over metropolitan St. Louis, Missouri in 1963-65 are described. Values of dispersion parameters derived from the tracer data are related to readily derived or measured meteorological indices of turbulence. The results are graphically presented in terms of best-fit curves as functions of downwind distance and travel time. Comparisons are made with the results of previous diffusion experiments conducted over relatively uncomplicated terrain in open country. For low-level point sources, the urban area affects cross-wind dispersion primarily by enhancing the initial size (i.e., close to the source) of the plume. As the plume becomes much larger than the size of eddies created by the local obstructions, the dispersion approaches that associated with flow over open country. In the vertically, significantly enhanced dispersion as well as an enlarged initial spread of the tracer cloud seem to occur; this enhancement in the rate of dispersion over that in open country appears somewhat greater for stable than for unstable meteorological conditions. Values of dispersion parameters from limited tracer experiments in other urban areas are similar to those reported here for St. Louis under the same gross meteorological conditions. (Author abstract modified)

1039 APTIC NUMBER 17401

Ministry of International Trade and Industry, Japan, Public Nuisance Section
DEVELOPMENT OF NEW SIMULATION SYSTEM FOR AIR POLLUTION FORECASTING. (Taikiosen yosoku no okeru atarashii shisutemu no kaihatsu ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(1):19-23, Jan. 15, 1970.

A new system for forecasting air pollution is planned by the Ministry of Industry and International Trade. Its development involves the systematization of the over-all air pollution administration by conducting experimental field research, largely dependent on a wind tunnel test, and the analysis of the obtained empirical research findings by a simulation method. The data will be stored in a data-bank to be available for computer analysis whenever new factories or land reformation projects are planned in a concerned area. The air pollution simulation system will correlate all possible data on air pollution existing in the areas of coastal plants with geographical features, weather conditions, existing atmospheric inversion layers, smoke dispersion factors, regional capability for plant construction, layout of equipment, qualitative and quantitative investigations of fuel consumed, numbers of chimneys and their height, amount of smoke discharged, variation of temperature and wind speed, sulfur dioxide density, and so forth. All these variable will be used as computer input. The experimental findings obtained from the wind tunnel test are to be applied to the simulation system, which is expected to cover the factors associated with complicated geographical influences or atmospheric inversions relatively indigeneous to coastal regions in Japan. Two methods of simulation are considered applicable; simulation of the spot data on weather analysis, statistical treatment of collected records on air pollution, characteristics of smoke dispersion, and correlation air pollution patterns; and simulation by a wind tunnel test, the latter considered more practical under present circumstantial provisions. The mathematical model for the air pollution simulation system is discussed.

1040 APTIC NUMBER 12369

Nickola, P. W. and J. D. Ludwick
THE MEASUREMENT OF PARTICULATE PLUME DEPLETION IN THE ATMOSPHERE BY COMPARISON WITH AN INERT GASEOUS TRACER. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II. Physical Sciences, Part 3. Atmospheric

Sciences. Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 65-75, Oct. 1968. 13 refs.
CFSTI: BNWL-715

The depletion of a plume of flourescent particles (FP 2210) was computed by comparing it to a plume of a nondepleting noble gas (Kr85). Both plumes were released simultaneously from a common source at 1.5 m. Exposure measurements were made on a grid of samplers at 200 and 800 m from the source. The sampling array included samplers on 10 towers. During traversal of the distance from 200 to 800 m from the source, 16% of the particulates in the plume was depleted. Depletion was highest near the surface. At breathing level (1.5 m) at 800 m, the crosswind-integrated exposure of the particulate plume was only half that of the inert gas plume. (Author abstract modified)

1041 APTIC NUMBER 12230

Onishi, Gaishi
A TWO-DIMENSIONAL, STEADY STATE NUMERICAL MODEL OF ATMOSPHERIC BOUNDARY LAYER FLOW OVER INHOMOGENEOUS TERRAIN. In: Theoretical Studies of the Atmospheric Boundary Layer. (Final Report). Hawaii Univ., Honolulu, Hawaii Inst. of Geophysics., Grant DA-AMC-28-043-64-G-2, Task IVO-14501-B53A-08, HIG-66-16, p. 81-122, Aug. 1966. 6 refs.

A method is presented for obtaining solutions to equations of motion for steady atmospheric flow over changing terrain roughness. The method was derived by assuming a change in the eddy viscosity coefficient coincident with the change in surface roughness and computing the resulting fields of horizontal and vertical velocity. For a shallow atmospheric layer, von Karman's constant is used to describe the value of the eddy viscosity coefficient, with the parameter of roughness length introduced to describe the wind profile; for a deep layer, the expression obtained by Blackadar for a neutral atmosphere is used. The obtained steady-state integration agrees well with the results of the theoretical and experimental results obtained by others. Since the method presented appears to adequately describe the neutrally stratified atmosphere, it should be capable of being generalized to describe the field of motion under a wider variety of atmospheric conditions. (Author conclusions modified)

1042 APTIC NUMBER 12187

Plass, Gilbert N., George W. Kattawar, and Charles N. Adams
MULTIPLE SCATTERING OF LASER LIGHT IN THE ATMOSPHERE. (FINAL REPORT). Southwest Center for Advanced Studies, Dallas, Tex., OAR Contract F19628-68-C-0181, Proj. 4144, Task 414426, AFCRL-68-0367, 23p., July 15, 1968. 8 refs.
CFSTI, DDC: AD 675155

The Monte Carlo method was used to calculate the path of photons in a real atmosphere that were emitted by a laser source. Th photons were emitted uniformly within a cone by the source and underwent collisions with the molecules and aerosols in the atmosphere. At each collision, either molecular Rayleigh scattering or absorption or aerosol (Mie) scattering or absorption may occur. The Mie single scattering function was calculated from the Mie theory for a size distribution of spherical particles. The atmosphere was divided into a number of layers, each of which had different properties. Reflection from both a target area and the background at the earth's surface was also calculated for various targets and background albedos assuming a Lambert surface. The radiance at a number of detectors at arbitrary locations within the atmosphere was also calculated. (Author abstract modified)

1043 APTIC NUMBER 12432

Prophet, David T.
VERTICAL DOSAGE PROFILES BASED ON EDDY DIFFUSIVITIES DERIVED FROM VERTICAL VANE DATA. Metronics Associates, Inc., Palo Alto, Calif., Aerosol Lab., Contract DA-42-007-AMC-21(N), TR 101, 42p., June 7, 1963. 2 refs.

A technique was described for estimating values of vertical eddy diffusivity directly from vertical vane data by expressing the observed magnitude of the vane angle deflections as a function of time. Values for eddy diffusivity were computed at heights up to 300 feet under stability conditions varying from strong inversion to nearly adiabatic lapse. The computed eddy diffusivities increase by three orders of magnitude as the stability decreases from strong inversion to nearly adiabatic lapse. For six field trials involving elevated and surface line releases of fluorescent particles, the computed values for eddy diffusivity were used in a modified form of Pasquill's diffusion equation for infinite line sources to compute vertical dosage profiles at heights up to 750 feet and at downwind distances up to ten miles. The extent of agreement between calculated and observed dosage profiles indicates that the values for eddy diffusivity computed by this method are at least of the correct order of magnitude. (Author abstract modified)

1044 APTIC NUMBER 16891

Radke, L. F. and P. V. Hobbs
MEASUREMENT OF CLOUD CONDENSATION NUCLEI, LIGHT SCATTERING COEFFICIENT, SODIUM-CONTAINING PARTICLES, AND AITKEN NUCLEI IN THE OLYMPIC MOUNTAINS OF WASHINGTON. J. Atmospheric Sci., 26(2): 281-288, March 1969. 7 refs.

Simultaneous measurements have been made of the concentrations of cloud condensation nuclei, sodium-containing particles, Aitken nuclei, and the magnitude of the light scattering coefficient of the air, for a period of two months in the Olympic Mountains of Washington State. Large short-term changes in the magnitudes of these four quantities were found to be related to variations in the local meteorological conditions. The most striking changes occurred with the build up and the evaporation of cumulus clouds upwind of the measuring site. The results indicate that growing clouds absorb (and also probably generate) large numbers of particulates, and that these particulates are released when the clouds dissipate. Precipitation also caused significant reductions in the concentrations of particulates in the air. Longer period variations in particulate concentrations were associated with the diurnal convective cycle and changes in air mass. Continental air contained higher concentrations of cloud condensation nuclei and Aitken nuclei than maritime air, but the Pacific Ocean

appeared to be the principal source of sodium-containing particles. However, even in maritime air the measured concentrations of sodium-containing particles were always less than about 1% of the concentrations of cloud condensation nuclei active at 1% supersaturation. (Author's Abstract)

1045 APTIC NUMBER 12361

Ramsdell, J. V.
THE USE OF INSTANTANEOUS PLUME MEASUREMENTS TO APPROXIMATE A MEAN PLUME. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, Vol. II: Physical Sciences, Part 3. Atmospheric Sciences. Battelle - Northwest, Richland, Wash., Pacific Northwest Lab., p. 12-18, Oct. 1968. 8 refs.
CFSTI: BNWL-715

In a number of diffusion experiments, instantaneous and mean measurements of the same plume were made. Twelve of the tests were then analyzed to determine the relationship between the mean and instantaneous properties of a diffusing plume. The analyses verified Gifford's fluctuating plume dispersion model and showed that a combination of mean plume measurements and mean plume approximations described diffusion in a realistic manner consistent with theory. It is possible, with the approximation techniques described, to extend diffusion studies to difficult places and situations. It is hoped to refine the techniques in further diffusion experiments. (Author conclusions modified)

1046 APTIC NUMBER 18014

Rosinski, J., G. Langer, and R. Bleck
REMOVAL OF AEROSOL PARTICLES AND FRACTIONAL SEPARATION OF HDO-H2O DURING SNOWSTORMS. J. Atmospheric Sci., 26(2):289-301, March 1969. 15 refs.

The concentrations of both deuterium and water-insoluble particles in snow collected during snowstorms in the mountains of Colorado were found to be proportional to the size of snowflakes. Large snowflakes were associated with high particle concentration and high deuterium content. Small snow crystals appear to have originated in deuterium and aerosol-particle depleted air. The small snow crystals appeared at times of highest iceforming nuclei concentration in air. The ratios of concentrations of different sized particles present in snow collected during a brief snowshower in March reveal that the predominant particles within small snow crystals are indeed those corresponding to the size range of ice nuclei. The relationship between the number of different sized particles present in a single snow crystal and the mass of snow crystals is given. Analyses of trajectories of moisture-bearing air parcels explained the large difference between the deuterium content of snow from the two snowfalls. (Author's Abstract)

1047 APTIC NUMBER 17337

Sato, Junji
THE RESULTS OF OBSERVATION ON PLUME RISE. (Haigasu jyoshoko no jisscku kekka). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 3(2):117-122, Aug. 31, 1969. 5 refs.

Plume rise from four scale-plants was observed. The efflux velocity at the top of stack, gas temperature (by a thermometer in the smoke tunnel), coloration of the smoke ball, direction of the smoke flux axis, and the height and vertical width of the plume were investigated. The smoke flux axis was continuously measured from the root of the stack to the leeward by the use of theodolite. The plume was simultaneously photographed from a height of 500 m -- 700 m, which gave the direction, growth, and winding of the plume. The observed values were compared with those calculated by Holland's, Bosanquet's, and Priestley's formulas. Wind velocity was measured with a pilot balloon at the height of the top of the stack. Atmospheric stability was determined as the difference in the temperature of two atmospheric layers, which were 50 m above and below the top of the stack. The results of Priestley's formula agreed with the observed values for small stacks but tended to underate the increment of heat emission, which is the result of monovaluation of the mixing coefficient, defined as a function of heat emission, modified. Priestley's formula can be applied to arbitrary scale stacks. This formula includes only wind speed and not atmospheric stability as the parameter and is applied to the neutral layer state. The concept of effective stack height must be recognized when exhaust gas smoke from real stacks is augmented by the diffusion formula.

1048 APTIC NUMBER 12262

Sklyarov, V. M.
THE PROBLEM OF WIND CONDITIONS IN THE GLOBAL BOUNDARY ATMOSPHERIC LAYER. Meteorol. Hydrol. (English translated from Russian of: Meteorol. i Gidrol.), no. 8:36-42, 1968. 5 refs.
CFSTI: JPRS 46 817

Investigations based on mechanical processing of mass aerological observations showed that at the 500 to 1000 meter level, there was a layer where the mean 24-hour wind velocity is constant or decreases with altitude. This finding is contrary to the popular concept of meteorologists who claim that the wind velocity always increases with altitude. In spring and summer, the maximum values of the mean velocity occur at certain hours of the 24-hour period, not at the upper levels of the boundary layer, but at the altitude of only 300 to 500 meters. Aerological observations over a five-year period (1959-1963) provided convincing proof that during certain seasons, the lowest and highest wind velocity may occur either during the day or night. In summer, the greatest mean wind velocity at the 1000 to 2000 m level takes place not at night but 2 to 3 hours after sunrise. The lowest velocity at this altitude is found during the daytime and in the second half of the night. This is in striking contradiction to a widely-held concept that above 100 m, the greatest wind velocity occurs always at night, and the lowest during the day.

1049 APTIC NUMBER 12353

Slawson, P. R.
ON THE MEAN PATH OF BUOYANT BENT-OVER PLUMES UNDER VARIOUS ATMOSPHERIC STABILITY CONDITIONS. Waterloo Univ., Ontario, Dept. of Mechanical Engineering, AEC Rept. NYO-3685-14, HR-13, 92p., Aug. 1968. 19 refs.
CFSTI: NYO-3685-14

Photographic observations were made on the rise of smoke plumes from a generating station in Ontario, in the spring of 1965 and 1967. Data relating to the stack variables were collected in detail. The mean path of a buoyant bent-over plume was described by a theory that considered the plume to rise in three distinct phases. The first phase was based on the entrainment hypothesis of Morton, Taylor, and Turner, 1956. The second and third phases modified this entrainment hypothesis considerably and were based on more established theory. The diffusion processes within the plume were attributed to self-generated turbulence and atmospheric turbulence of the inertial subrange eddies and the energy containing eddies for the second and third phases, respectively. Observations indicated that the dynamical problem of plume rise is very complex. This complexity was illustrated in the wavy appearance of plumes observed at the generating station in unstable atmospheric conditions. Further evidence was collected in 1967 which gave the linear rising plume for the final phase in neutral atmospheric conditions. The relatively simple theory presented correctly predicted (at least qualitatively) the complex observed plume paths and emphasized the important physical factors required to adequately describe this path. The plume's own physical size and the atmospheric turbulence level had a more direct effect on plume behavior than the observed atmospheric temperature gradients, at least for distances from the source of a few thousand feet. In some cases where the plume bends over sharply very near the source, the effect of the initial size and momentum of the plume may be important. (Author abstract modified)

1050 APTIC NUMBER 12407

Sood, Sudesh K. and Meryl R. Jackson
SCAVENGING STUDY OF SNOW AND ICE CRYSTALS. (FINAL REPORT). IIT Research Inst., Chicago, Ill., Technology Center, Contract AT(11-1)-578, Project C6105, IITRI-C6105-5, 36p., Sept. 12, 1968. 15 refs.
CFSTI: TRI - 578-P32-5

The scavenging efficiency of simulated snow and ice crystals was determined in experiments conducted in a vertical flow laminar test chamber. Paper plates with thickness corresponding to a fall velocity of 30-40 cm/sec were used as aerodynamic equivalents of snowflakes throughout the study. The scavenged aerosol consisted of spores of B. Subtilis of one micron diameter. Scavenging efficiency of the plates was nearly independent of aerosol concentration and the number of particles deposited on the edge of a plate varied linearly with the perimeter to surface ratio of the plate. Scavenging efficiency of the plates was increased by electrostatic charges, and the edge of a plate scavenged the aerosol more efficiently than the flat surface.

1051 APTIC NUMBER 12348

Swan, Charles H.
METEOROLOGICAL CONDITIONS AS RELATED TO AIR POLLUTION. CHICAGO, ILLINOIS, APRIL 12-13, 1963. Environmental Science Services Administration, Kansas City, Mo., Weather Bureau, WBTM CR-25, 27p., Oct. 1968. 2 refs.

A case study is presented of the relationship between surface wind and the deposition of particulate pollutants, by the detailed analysis of a selected 24-hr period in Chicago, Ill. The analysis used sea-level pressure in a multi-state area surrounding Chicago and the streamlines, isotachs, and trajectories within the immediate Chicago area. The data used were from municipal maps of pollutant amounts deposited at 19 stations in a 24-hr period; a streamline-isotach analysis was performed on tow sets of hourly maps containing measurements of various meteorological parameters. A line of convergence or deformation, or a combination of these, existed over the city for the first half of the period which had a significant effect on deposition patterns. Two-dimensional air trajectories were used to relate pollution patterns to sources by tracing the movement of air parcels backward in time and thus locating source areas, and by tracing the parcels forward in time from a known source to show whether or not a particular source contributed to a particular pollution pattern. The backward method is described in some detail with a description of the sources thus determined. The results of the analysis may be useful in predicting the distribution of particulate pollutants over Chicago; as a case study, it points up the significance of meso-scale conditions in pollution problems.

1052 APTIC NUMBER 16629

Szepesi, Dezso
METEOROLOGICAL CONDITIONS OF THE TURBULENT DIFFUSION OF ATMOSPHERIC POLLUTANTS IN HUNGARY. (Legszennyezo anyagok turbulens diffuziojanak meteorologiai folteteleri magyarorszagon). Az Orszagos Meteorologiai Intezet Hivatalos Kiadvanyai (Budapest) (Natl. Meteorol. Inst. Offic. Publ.), vol. 32, 168p., 1967. 83 refs. Translated from Hungarian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 207p., Sept. 1969.

A mathematical model is developed to incorporate the meteorological factors influencing the dilution of atmospheric pollutants from a point source, with a view towards optimizing the location of such installations as electric power plants. The model takes into account wind direction, wind speed, vertical wind profile, and thermal stratification by use of the equation of turbulent diffusion, with results calculated in average number of hours per year during which a concentration of pollution exceeds a given level. The computations are made by computer, and solutions based on new industrial and meteorological data can therefore be obtained rapidly. The method is applicable to sites at which ground level and upper-air wind observations have been made for at least a year or which are located no more than 150 km from an existing meteorological observatory in a broad lowland-type area. The turbulent diffusion equations are also programmed for determining the necessary stack height and emission velocity of the combustion gases of a power plant to achieve permissable emission levels in the region surrounding the power plant. The principal subject headings dealt with are meteorological, topographic, and industrial factors in air pollution; quantitative

analysis of meteorological data; early investigations of turbulence and diffusion by Turner; and theory and application of the turbulent diffusion method. Two-hour values of the stability parameter for Budapest and 12 other cities for 1959-1963 have been calculated and are presented in a form ready for computerization; the values were interpolated from four daily radio sonde ascents on the basis of observed values of cloud cover, temperature, and the hourly wind values with reference to the isopletes of the average temperature gradients of the lower 300 m of the atmosphere.

1053 APTIC NUMBER 12231

Yamomye, Edwin T.
THE RESPONSE OF THE ATMOSPHERE TO A LOCALIZED HEAT SOURCE AT THE EARTH'S SURFACE. In: Theoretical Studies of the Atmospheric Boundary Layer. (Final Report). Hawaii Univ., Honolulu, Hawaii Inst. of Geophysics, Grant DA-AMC-28-043-64-G-2, Task IVO-14501-B53A-08, HIG-66-16, p. 123-173, Aug. 1966. 10 refs.

Hydrodynamic equations are integrated numerically to determine how the atmosphere reacts to a localized heat source at the earth's surface. The heat source considered is 10 km wide and infinitely long, and could represent a flat island or a peninsula in the ocean, a dry strip of land in a large irrigated field or marsh, or any similar configuration where a region of high solar absorptivity is surrounded by an extensive area of relatively low absorptivity. By imposing different temperatures at the surface of the heat source and keeping the surrounding temperature fixed, the effect of the intensity of heating is studied; by varying the speed of the basic current flowing over the heat source, the influence of wind is considered. A total of nine numerical integrations are performed for different combinations of the basic current and surface temperature differences. The results indicate that the intensity of the disturbance generated by the heat source is large when the surface temperature difference is large and/or the basic current is weak. When the surface temperature difference is small and/or the basic current is strong, the intensity of the disturbance is small. (Author abstract modified)

1054 APTIC NUMBER 12356

Terry, E. R., B. H. Greene, E. V. Gadecki, E. Neuman, F. A. Record, G. J. Boer, E. V. J. Wong, and H. Nicolopoulos
BIBLIOGRAPHY ON ATMOSPHERIC TRANSPORT, DISPERSION AND DEPLETION PROCESSES. VOLUME II. GCA Corp., Bedford, Mass., Technology Div., Contract DAAD 09-27-C-0128, RDT and E Proj. DA 1V025001A128, TR-67-26-G (II), 287p., Feb. 1969. 2112 refs.

A cumulative bibliography listed alphabetically by author for each year and cross-indexed by subject headings and key-word descriptors was compiled of atmospheric transport, dispersion and depletion processes. The bibliography includes both foreign and domestic journal articles, books, reports, and special bibliographies published primarily since World War II. Only more important works published prior to World War II were listed. (Author abstract modified)

1055 APTIC NUMBER 11979

Ubl, Zdenek
CHEMICAL COMPOSITION OF PRECIPITATION WATERS. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide an Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 51-54.

Based on analyses of precipitation samples from various regions of Czechoslovakia, a hypothesis is developed which states that a portion of the compounds in precipitation water originate in dissolved condensation nuclei and a portion in substances captured by the atmosphere. According to the hypothesis, a limit concentration, independent of the precipitation total, exists in clean atmospheres. All concentration values will therefore lie within an area limited by a line parallel to the axis of precipitation totals and concentration totals. The occurrence of these concentrations is explained by the dissolving of condensation nuclei. In this case, the concentrations will be distributed in an area limited by the concentration axis, axis of precipitation totals, and a roughly hyperbolic curve. In polluted atmospheres, concentrations higher than the limit value will appear in small pollution totals; their frequency will increase with increasing pollution. Increasing totals will be accompanied by decreasing frequency of high concentrations until values corresponding to clean atmospheres are approached. It is suggested that approximate estimations of contamination by flue gases can be obtained by analysis of precipitation water samples.

1056 APTIC NUMBER 12428

Vaughan, L. M. and R. W. McMullen
INTERMEDIATE-SCALE AEROSOL CLOUD TRAVEL AND DIFFUSION FROM LOW-LEVEL AERIAL LINE RELEASES. Metronics Associates, Inc., Palto Alto, Calif., Aerosol Lab. Contract DA-42-007-CML-543, TR-97, 81p., Jan. 30, 1963. 12 refs.

A series of low-level aerial line releases of flourescent particles under a variety of atmospheric stability conditions was conducted. Meteorological conditions for different trails ranged from strong inversion to moderate lapse with wind speeds at 150-300 feet ranging from 5 mph to greater than 20 mph. Cloud cover varied from clear to overcast. Altitudes for different releases ranged from 100-450 feet and the length of dissemination was approximatley 14 miles. The proper order to magnitude of vertical diffusion was predicted from the calculated eddy diffusivities; lack of agreement between calculated and observed dosages in some trials was primarily due to enfilading and edge effects. The maximum ground level dosage obtainable from an elevated line release was relatively independent of atmospheric stability and approximately equal to one-half the source strength divided by the product of mean wind speed and release altitude. The distance at which the maximum occurs, however, was very dependent upon stability. It appeared that for elevated release, the use of a mean diffusivity and a mean wind speed through the first 1000 feet gives almost as good results as fitting the diffusivity and wind profiles by power laws. Since the dosage calculations for constant diffusivity are simpler and can be made readily from a suitable nomogram, the use of constant diffusivity and wind is recommended for diffusion calculations for cloud travel to distances of 10-20 miles. (Author summary modified)

1057 APTIC NUMBER 17366

Walsh, John D.
METEOROLOGICAL FACTORS IN PLANT SITING: AN OVERVIEW. Air Pollution Control Assoc., Pittsburgh, Proc. Air Pollution Control Assoc. Mid-Atlantic States Sect., Semi-Annu. Tech. Conf., Philadelphia, Pa., 1969, p. 62-69. (March 21.)

At the present time, industry, with one exception, does not place meteorological or environmental considerations on the same level as more immediate economic factors in considering plant siting. The exception is the nuclear industry, where every facet of siting, construction, and operation is carried out under stringent review conditions. Meteorology is an important factor in plant siting, and one which deserves attention if only to the extent of assuring those parties concerned that local meteorology is no impediment to profitable operations or good community relations. Where the meteorology of an area is of primary importance, meteorological factors must be considered on an equal footing with other siting factors. The justification of this approach arises from the current state of development of air pollution control techniques and devices. If a site meets all the requirements except for an unfavorable meteorological situation, a favorable environment can still be secured by the installation of high stacks or efficient control devices, or the purchase of large amounts of land.

1058 APTIC NUMBER 12320

Altshuller, A. P., S. L. Kopczynski, D. Wilson, W. Lonneman, and F. D. Sutterfield
PHOTOCHEMICAL REACTIVITIES OF PARAFFINIC HYDROCARBON-NITROGEN OXIDE MIXTURES UPON ADDITION OF PROPYLENE OR TOLUENE. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Div. of Chemistry and Physics, 16p., 1969. 8 refs.

Effects associated with photochemical air pollution including nitrogen dioxide and oxidant dosages, yields of formaldehyde and peroxyacetyl nitrate, and eye irritation response, were measured during irradiation of n-butane - nitrogen oxide or n-butane - ethan - nitrogen oxide mixtures, with small amounts of propylene or toluene added. In some mixtures, propylene was added to n-butane to give hydrocarbon ratios ranging from 0 to 0.25 to 1; in others, toluene was added to provide a hydrocarbon ratio of 0.5 to 1. Irradiations were carried out in two 335-cu ft chambers, with 6-hr periods of static irradiation. Beneficial effects resulted from selective changes in hydrocarbon composition as well as from reduction of total hydrocarbon concentration. Exclusion of olefins and alkylbenzenes was highly effective in reducing oxidant dosage, formaldehyde and peroxyacetyl nitrate concentrations, and eye irritation response. The only negative results was a modest increase in nitrogen dioxide dosage. A large reduction in nitrogen oxide concentration reduced nitrogen dioxide dosage and eye irritation response, but resulted negatively in a large increase in oxidant dosage. The results indicate that control of the photochemical aspects of air pollution can be accomplished more rapidly by preferential reduction of olefins and alkylbenzenes than by reduction of total hydrocarbon concentration. It is recommended that research and development efforts be directed toward preferential hydrocarbon control by mechanical or catalytic control devices or by modifications in fuel composition. (Author abstract modified)

1059 APTIC NUMBER 12137

Altshuller, A. P. and S. P. Sleva
REACTION OF DIMETHYLAMINOBENZALDEHYDE IN SULFURIC ACID WITH LIQUID OLEFINS. Preprint, American Chemical Society, Washington, D. C., 11p., 1961 (?). 5 refs. (Presented at the Symposium of the American Chemical Society Air Pollution, 136th National Meeting, Atlantic City, N. J., 1959.)

The absorptivities of products of the reaction of liquid olefins with varying ratios of dimethylaminobenzaldehyde (DAB) and sulfuric acid were measured in the 500 millimicron region with a spectrophotometer. The products were found to absorb about as intensely as products formed by vapor phase olefins. All liquid monoolefins reacted at a 1:8 ratio of DAB to sulfuric acid to form products with a maxima at 500 millimicrons and shoulders at 475 millimicrons. The conjugated diolefins 2-methylbutadiene-1,3 and 2,3-dimethylbutadiene-1,3 also formed products with a maxima at 500 millimicrons and shoulders at 475 millimicrons. However, the band systems formed by other diolefin products varied. The liquid olefins could not be determined by the DAB reagent in liquid mixtures containing higher alcohols, esters, ethers, or heterocyclic sulfur compounds. The method is applicable to mixtures of olefins with other aliphatic materials including paraffins, acetylenes, and some types of aldehydes, ketones, esters, ethers, and acids.

1060 APTIC NUMBER 17389

Baddour, Raymond F. and Michael Modell
THE EFFECT OF VISIBLE AND ULTRAVIOLET LIGHT ON THE PALLADIUM-CATALYZED OXIDATION OF CARBON MONOXIDE. J. Phys. Chem., 74(6): 1392-1394, March 19, 1970. 11 refs.

Reaction rates were qualitatively determined for carbon monoxide oxidation over palladium in the presence of light and in the absence of radiation. The catalyzed dark reaction rate was first order in oxygen partial pressure from 1 to 10 Torr 02. The irradiated reaction rate was measured using unfiltered light at constant oxygen and carbon monoxide partial pressures of 14.7 and 6.1 Torr, respectively, at 130 to 170 deg. The reaction rate increased by 1000% at 135 deg and 300% at 165 deg due to irradiation. The decreasing photoeffect with increasing temperature was confirmed in subsequent experiments. The irradiated reaction rate using a Vycor cut-off filter was the same order of magnitude as that observed with unfiltered light. However, with a Pyrex cut-off filter, the irradiated reaction rate was undistinguishable from that of the palladium-catalyzed dark reaction. The photoeffect is thought to be due to the excitation of an adsorbed carbon monoxide surface species by absorption of a photon. For CO oxidation over palladium, the rate-limiting step for the dark reaction is thought to be either molecular oxygen adsorption or surface reaction. Carbon monoxide inhibits the rate by reducing either the rate or the extent of oxygen adsorption. Thus, either desorption or reaction of electronically excited CO surface species could lead to an enhanced reaction rate during irradiation.

1061 APTIC NUMBER 11770

Ballod, A. P., S. I. Molchanovo, and V. Ya. Shtern
MECHANISM OF THE VAPOUR-PHASE INTERACTION OF ALKANES WITH NITROGEN DIOXIDE. (THE KINETICS AND CHEMICAL PECULIARITIES OF THE SLOW REACTION C3H8-NO2). Neftekhimiya (Russia), 7(1):115-123, 1967. 20 refs. Translated from Russian. Ministry of Technology, Orpington Kent, England, TIL Reports Centre, TIL/T 5757, Aug. 1968.
CPSTI: N68-31918

The kinetics and chemical peculiarities of the slow nitration reaction between propane and nitrogen dioxide were studied under static conditions in a vacuum apparatus. The determination of reaction orders was performed by observing the relationship between the initial reaction speed, and the concentration of one of the reactants, with constant concentration of the other reactant. The speed of the reaction was determined photometrically from the consumption of the nitrogen dioxide; the development of the reaction was determined from the logarithmic curve of the relationship between the initial reaction speed and the partial pressures of propane and nitrogen dioxide. The orders of the slow reaction were found to be

temperature dependent: at 225 and 250 deg, the order according to C3H8 was 1.0: at 300 and 350 deg, the order according to C3H3 was 0.75 and according to NO2, 1.6. The effective activation energy of the reaction was 30,000 plus or minus 2000 cal/mol at 200-350 deg. At 250 deg, the end products of the slow reaction were nitro-alkanes which underwent further transformations at 350 deg. Intermediate products of the slow reaction were acetaldehyde, isopropyl alcohol, and methyl nitrite. Acetone was formed by secondary reactions; it did not experience any further transformation.

1062 APTIC NUMBER 12447

Belyantsev, A. M., L. S. Dolin, and V. A. Savel'yev
PROPAGATION OF SHORT DURATION LIGHT PULSES IN A TURBID MEDIUM. Izv. Vysshikh Uchebn. Zavedenii Radiofiz., 10(4):489-497, 1967. 2 refs. Translated from Russian. Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 12p., April 30, 1968.
CFSTI: AD 679674

An analytical investigation was made of time-dependent distortions of a pulse light signal transmitted by a narrow beam through an infinite turbid medium. The analysis proceeded from nonstationary transfer equations and considered single and double scattering approximations under conditions of a spherical-isotropic indicatrix. The distortion of the pulse shape at the receiving end and the pulse shape as back-scattered from the thickness of the medium were determined. The effect of the aperture radius of the receiving pupil on the cross-sectional distribution of light intensity and the effect of the distance of the source were considered. The relationships were presented in the form of graphs. A criterion was also established for taking into account multiple scattering in the estimation of back-scattering. (Author abstract modified)

1063 APTIC NUMBER 18019

Bufalini, J. J. and A. P. Altshuller
OXIDATION OF NITRIC OXIDE IN THE PRESENCE OF ULTRAVIOLET LIGHT AND HYDROCARBONS. Environ. Sci. Technol., 3(5):469-472, May 1969. 19 refs.

The oxidation of nitric oxide has been investigated in the presence of 2,3-dimethyl-2-butene, 1-butene, 1,3,5-trimethylbenzene, and n-butane. Nitrogen dioxide dosage curves are shown as a function of HD/NOx ratios with NOx kept constant. The NO2 dosage increases very quickly with increasing concentrations of 2,3-dimethyl-2-butene and 1,3,5-trimethylbenzene. Greater concentrations of 1-butene and n-butane are required to obtain similar increases in NO2 dosage. Oxidant was observed only after maximum dosage had been achieved. No oxidant was observed for the n-butane-NOx system under the conditions employed in this study. Neither the rate of oxidation of nitric oxide nor the rate of reaction of the hydrocarbon increased when water vapor was increased from 1.1 to 11 mm. (Author's Abstract)

1064 APTIC NUMBER 12185

Burggraf, Odus R.
A LINEARIZED ANALYSIS OF MASS-TRANSFER EFFECTS ON CONFINED LAMINAR VORTEX FLOWS. Ohio State Univ. Research Foundation, Columbus, OAR Contract AF33(615)-1063, Proj. 7116, ARL 68-0071, 42p., April 1968. 15 refs.
CFSTI, DDC: AD 674612

A theoretical analysis of mass transfer effects on confined laminar vortex flows was presented, with emphasis on the structure of the flow at the limits of very large and very small rotational Reynolds number. For large Reynolds number, a linearized theory was formulated for a swirl chamber of arbitrary smooth configuration, within the limitation of axisymmetric flow, based on the boundary-layer model introduced by Proudman. The method of solution was illustrated by applying it to special types of mass transfer in a spheroidal swirl chamber. The essential features of the flow pattern revealed by the theory were that the mass is transferred from an annular injector ring to an axial exit nozzle partly by surface flow in the boundary layer and partly by helical flow through the body of the inviscid core. For mass transfer unsymmetric with respect to the equatorial plane, a viscous jet along the axis of symmetry completes the fluid circuit. For small Reynolds number, the Stokes-flow theory was applied to the case of a spherical swirl chamber and exact solutions were obtained for the complete flow field for arbitrary mass-transfer distribution. Numerical results were obtained for an equatorial injector band with axial exit nozzles, permitting comparison with the corresponding results for the high Reynolds number case. For the Stokes flow, a radially inward motion exists throughout the chamber. The streamline slope (radial to tangential) in the equatorial plane increases by a factor greater than 6 as the flow progresses inward toward the axis, asymptotically following logarithmic spirals about the axis. By examining the detailed structure of the viscous flow in the vicinity of the injector band, it was found that approximately one third of this amplification of streamline slope is caused by viscous effects in the immediate neighborhood of the injector band. (Author abstract modified)

1065 APTIC NUMBER 11825

Busch, N. E.
A NOTE ON THE MONIN-OBUKHOV SIMILARITY HYPOTHESIS FOR FULLY TURBULENT FLOW WITH NEGLIGIBLE HORIZONTAL MEAN-PRESSURE GRADIENT AND A STEADY, PARALLEL MEAN FLOW. In: Notes on the Theoretical Basis of the Equations for the Atmosphere's Surface Layer. Environmental Science Services Administration, Oak Ridge, Tenn., Inst. for Environmental Research, TM-IERTS-ATDL 7, p. 31-49, Nov. 1967. 10 refs.

The Monin and Obukhov similarity hypothesis for fully developed turbulent flow over horizontally homogeneous terrain has been used by many writers investigating the behavior of the lower layer of the atmosphere. However, few writers have tried to formulate the hypothesis in a way that points directly to the assumptions leading to the hypothesis, thus indicating its possible limitations. In the present investigation, the statistical nature of the hypothesis is discussed, and an attempt is made to clarify the theoretical background of the hypothesis. (Author introduction modified)

1066 APTIC NUMBER 17390

Chechko, V. A., V. N. Anokhin, L. A. Tarasov, V. N. Teslenko, and I. P. Mukhlenov
INVESTIGATION OF IRON-CHROMIUM CATALYST ON ALUMINA-SILICA SUPPORT FOR CONVERSION OF CARBON MONOXIDE IN A FLUIDIZED BED. J. Appl. Chem. USSR (English Translation from Russian of: Zh. Prikl. Khim.), 42(8):1608-1611, Aug. 1969. 11 refs.

The influence of the temperature of ignition of the decomposition proceducts of ferric nitrate and of its mixtures with chromic anhydride on their specific surface and catalytic activity in the conversion of carbon monoxide with steam was studied. Specific surface is dependent on the ignition temperature. The maximum specific surface is at ignition temperature below 400 deg and the specific surface decreases with an increase of temperature and chromic anhydride content. A mixture of iron chromium oxide has a specific surface greater than Fe2O3 and Cr2O3 prepared separately. Conversion of carbon monoxide depends on the ignition temperature used for preparation of the iron-chromium catalyst and reaches a maximum in the region of 200-250 deg. Undecomposed iron chromium mixture retains more water of hydrogen at low ignition temperatures and activity of the catalyst is increased.

1067 APTIC NUMBER 12189

Conway, John G., B. Meyer, J. J. Smith, and L. J. Williamson
ZEEMAN EFFECT ON PHOSPHORESCENT LIFETIME OF MATRIX ISOLATED SO2. California Univ., Berkeley, Lawrence Radiation Lab., AEC Contract W-7405-eng-48, Rept. UCRL-18657, 11p., Nov. 1968. 8 refs.

The phosphorescent lifetime of sulfur dioxide as a function of magnetic field was studied at 4 K in sulfur hexafluoride, oxygen, and zenon at zero and 26 kGauss, and at 20 K in sulfur hexafluoride between zero and 90 kGauss. At high fields, the decay consists of two lifetime components. One is identical with the zero field lifetime of SO2; the second has a lifetime approximately 50% longer, depending on magnetic field. (Author abstract modified)

1068 APTIC NUMBER 18055

Csanady, G. T.
DOSAGE PROBABILITIES AND AREA COVERAGE FROM INSTANTANEOUS POINT SOURCES ON GROUND LEVEL. Atmos. Environ., 3(1):25-46, Jan. 1969. 13 refs.

Assuming that the dosage probability distribution in the "core" region of a diffusing cloud is log-normal a number of probabilistic results are derived for point-source generated clouds diffusing near ground level. The results also apply to the distribution of concentration (over a given sampling period) in the wake of a continuous source. The topics treated include: "Overdose factors" necessary to ensure a given dosage at a fixed point with a given probability; equal dosage probability contours; the area covered by a certain dosage with a given probability; the mean and the variance of the area covered in individual trials by a given dosage; the effect of meandering on the dosage probabilities at fixed points; and the ratio of an appropriately defined "peak" dosage to the local mean. (Author's Abstract)

1069 APTIC NUMBER 12171

Downs, Alan R.
ATMOSPHERIC TRANSMISSION OF LIGHT FOR CLEAR AIR AND FOG IN THE SPECTRAL REGION 0.35 TO 1.10 MICRONS. Ballastic Research Labs. Aberdeen Proving Ground, Md., RDT and E Proj. 1M523801A286, BRL MR-1561, 45p., April 1964. 12 refs.
CFSTI, EDC: AD 440333

A method for determining light transmission in an ideal atmosphere with humidity ranging from 0.1 to 100 times ten to the minus 6 g/cu cm at -40 to +60 C over path lengths of 1000 to 5000 m is described. Horizontal light paths near sea level and wavelength intervals of 0.05 micron over the range 0.35-1.10 micron were used. Modification of the model to account for the presence of fog is explained. Transmissions are given for varying amounts of fog over path lengths up to 200 m. This same method does not apply to haze because of small droplet size and consequent wavelength dependence; hence visual approximation are substituted.

1070 APTIC NUMBER 12212

Duchon, Claude E.
TECHNIQUES FOR EVALUATING METEOROLOGICAL AIRCRAFT DATA. Texas Univ., Austin, Atmospheric Science Group, NCAR Contract 49-67, NSF Grant GA-367X, Rept. 9, 93p., May 1968. 7 refs.

Two aircraft were flown side-by-side and one-over-the-other across the upper Texas coast simultaneously gathering meteorological data. Temperature was analyzed in an effort to estimate the noise in the data. The term 'noise' included noise put into the data by the recording system, the data reduction system, and atmospheric noise. Spectrum and cross-spectrum analysis techniques were applied. A stochastic model of the data was hypothesized from which the computations of noise as a function of frequency were performed. The calculated noise variance was found to decrease with increasing frequency, as is the case of a red noise spectrum. A possible cause for the red character of the noise spectrum was the finite separation between aircraft, but a cross-examination of the temperature traces seemed to rule out this mechanism. Comparisons between noise variance spectra and output signal spectra revealed a cut-off wavelength of about 4000 ft, below which no useful geophysical information can be obtained. These results hold only with respect to the experiments described; in other meteorological situations, shorter waves may be detectable if the variance is sufficiently greater than the noise variance. Adjunct topics are reddening of data by an instrument time constant, methods for computing empirical confidence limits along with examples, and a technique for evaluating the instrument time constant using aircraft flying at different speeds. (Author abstract modified)

1071 APTIC NUMBER 17384

Ehrlich, Richard, Sol Miller, and Robert L. Walker
RELATIONSHIP BETWEEN ATMOSPHERIC TEMPERATURE AND SURVIVAL OF AIRBORNE BACTERIA. Appl. Microbiol., 19(2):245-249, Feb. 1970. 6 refs.

Aerosol decay rates were determined for airborne Serratia marcescens, Escherichia coli, and spores of Bacillus subtilis var. niger at a temperature range of -40 to 49 C. Spores of B. subtilis exhibited high biological stability in the range -29 to 49 C. Although the differences among estimates of biological decay rate in this temperature range were not supported statistically, the death rate appeared to be highest at 49 C. Aerosol recoveries of B. subtilis at 4-min cloud age were similar from 4 to 49 C., confirming the high aerosol stability of this agent. The aerosol decay rates of S. marcescens and E. coli were closely related to temperaute. In general, an increase in temperature resulted in an increase in the biological decay rate. For airborne S. marcescens, the increase appeared to be linear from -18 to 49 C. At 40 C, the death rate resembled more closely that observed at 24 C rather than those at -18 or -2 C. With E. coli, differences in biological decay rate estimates from -40 to 24 C could not be discriminated statistically, although numerical values indicate the death rate was three times as rapid at -2 and 24 C as at -40 or -18 C. Between -18 to 24 C, the differences among aerosol recoveries of S. marcescens and E. coli were relatively uniform. Between 29 and 49 C, progressively lower aerosol concentrations were observed.

1072 APTIC NUMBER 12327

Fang, C. S., C. A. Morgan, L. K. Huang, H. S. B. Setty, M. W. Woodard, and H. W. Prengle, Jr.
INFRARED EMISSION SPECTROSCOPY - RADIATION FROM HOT GASES. (IRES PROJECT). Houston Univ., Tex., Thermodynamics and Kinetics Research Lab., PHS Grant 1 HO 1 AP 00578-01, PH-2, 37p., Feb. 15, 1969.

In calculations of radiant energy fluxes from an emitting plume through an absorbing medium, the spectral emission coefficient, spectral absorption coefficient, spectral emissivity, or appropriate mean values of these quantities of each gas species in the plume must be available. A 3-dimensional energy transfer model is refined, and an approximate 2-dimensional model is derived. Computer programs are developed for these two models. Additional literature searches are performed for absorption coefficient data for the gas species involved (CO, CO2, NO, NO2, N2O4, NH3, SO2, CH4, and H2O). Details and specifications on commercially available equipment (interferometer spectrometer, auxiliary optics, control unit, detector module, signal channel, and computer) are examined. Two-dimensional derivations and the computer program for calculating radiative energy flux using the two-dimensional model are presented.

1073 APTIC NUMBER 11872

Fatiadi, A. J.
OXIDATION PRODUCTS OF PERYLENE. National Bureau of Standards, Washington, D. C., TN-427, p. 12-16, Oct. 1967. 6 refs.

Pure reference compounds of perylene, particularly the various oxidation products, were needed in connection with a study of the products resulting from photochemical reactions of perylene adsorbed on various particulates. The preparation of 1,12-perylenequinone and 4,9-dihydroxy-3,10-perylenequinone are described. The 1,12-dione was obtained by a published procedure involving cyclization of 2,2'-dihydroxy-1,1'-binaphthyl with aluminum chloride, to give 1,12-perylenediol which was then oxidized with air and lead dioxide to give crude 1,12-perylenequinone. This process was not very efficient, as the desired dione is a labile compound which is difficult to purify. Preliminary values for peaks in its ultraviolet and visible spectra are given in a table. Preparation of 4,9-dihydroxy-3, 10-perylenequinone involved heating a solution of 3,4,9,10-tetranitro-perylene in concentrated sulfuric acid at 140 C for six hours. The product was recrystallized from nitrobenzene to give lustrous, blue crystals, melting at 483-485 C (with sublimation and some decompostion). Preliminary values for peaks in its ultraviolet and visibe spectra are given in a table.

1074 APTIC NUMBER 16856

Fraust, Charles L. and Edward R. Hermann
THE ADSORPTION OF ALIPHATIC ACETATE VAPORS ONTO ACTIVATED CARBON. Am. Ind. Hyg. Assoc. J., 30(5):494-499, Sept.-Oct. 1969. 14 refs.

The physical adsorption of ethyl acetate, propyl acetate, butyl acetate, and amyl acetate vapors onto activated carbon was studied in this investigation. Analyses were performed with a gas chromatograph. Of prime concern was variation in breakthrough behavior for different mass rates and mesh sizes of activated carbon. The mass rates employed varied between 0.0409 mmole/min and 0.0020 mmole/min. Mesh sizes of activated carbon studied were 4-6, 8-12, 16-20, and 30-40. Also shown are results from breakthrough data correlated with mass rate for each set of conditions employed in these experiments. (Author's Abstract)

1075 APTIC NUMBER 12421

Frisch, H. L. and F. C. Collins
THEORETICAL INVESTIGATION OF THE GROWTH OF AEROSOL PARTICLES BY DIFFUSION. Polytechnic Inst. of Brooklyn, N. Y., Dept. of Chemistry, Contract AF 19 (122)-412, SR-3, 9p., 1969. 5 refs.
CFSTI, DDC: AD 680690

The effect of the velocity of a freely falling aerosol droplet upon its diffusion-controlled growth rate was mathematically analyzed. The velocity of the droplet in the diffusion field does not significantly accelerate its growth unless the radius of the particle exceeds 0.001 cm. Thus it appeared that the effect of the gravitational fall of aerosol droplets during their growth from the supersaturated vapor may be safely neglected. (Author abstract modified)

1076 APTIC NUMBER 11930

Fuks, N. A., I. B. Stechkina, and V. A. Staroselsky
DETERMINATION OF DISTRIBUTION OF AEROSOL PARTICLES ACCORDING TO SIZE BY DIFFUSION METHOD. Inzh. Fiz. Zh. Akad. Nauk Belorussk SSR, 5(12):100-103, Dec. 1962. 8 refs. Translated from Russian. Atomics International, Canoga Park, Calif., 7p.

De Marcus's formula for calculating the size of a monodisperse aerosol by the diffusion method is applied to polydisperse aerosols. The law of a log-normal particle distribution is adopted for this purpose and the De Marcus formula is generalized by the inverse Laplace transformation. The diffusion precipitation is calculated with the use of a computer over the average geometric radius between 0.00001 and 10 to the minus 7th power, as well as the standard geometric deviation from 1 to 2.5. The mean diameter of aerosol particles can be determined from three measured values of the deviation between the number of particles flowing through a canal and those entering it and the volume velocity of flow depicted in the plot. (Author summary modified)

1077 APTIC NUMBER 11823

Gifford, F.
DIMENSIONAL ANALYSIS OF THE SURFACE LAYER EQUATIONS. In: Notes on the Theoretical Basic of the Equations for the Atmosphere's Surface Layer. Environmental Science Services Administration, Oak Ridge, Tenn., Inst. for Environmental Research, TN-IERTN-ATDL-7, p. 17-22, Nov. 1967.

The Calder equations governing the mean velocity, temperature, and pressure profiles in the surface layer were given. Dimensional analysis techniques were applied to the Calder equations. The nondimensional form of the differential equations for the mean gradients in the surface layer was obtained. The exercise of obtaining the equations supported the conclusion that an auxiliary hypothesis is required to get any kind of a final result. Profile equations cannot be considered to be strictly mathematical consequences of the governing equations. By putting the surface layer equations in dimensionless form first, several interesting aspects were brought out. In particular, the well known stability length was derived as a natural consequence of casting the problem in the dimensionless form.

1078 APTIC NUMBER 16079

Glukhov, S. A.
THEORY AND DESIGN OF EJECTION-TYPE ATOMIZER. Med. Tekhn., Nov.-Dec. 1968:20-26, 7 refs. Translated from Russian. Joint Publications Research Service, Washington, D. C., JPRS 47395, 12p., Feb. 6, 1969.

Theoretical and experimental data are presented for the parameters affecting the process of liquid atomization by ejection-type atomizers used in aerosol therapy. Equations are given for calculating working air pressure, air flow rate, efficiency, mean mass radius of the aerosol particles, and the flow rate of atomized liquid. The working air pressure in front of the atomizer is one of the most important parameters determining the operation of an atomizer. By varying the air pressure, the flow of air from the atomizer to a patient's lungs can be kept within the value necessary for minute ventilation. The mean mass radius determines the penetration of aerosols to the lungs and their retention there. It decreases with an increase in the relative velocity of air flow and effluent liquid jet and with a decrease in the radius of the liquid nozzle. Atomizer efficiency increases with a decrease in the density of the sprayed liquid. Therefore, to avoid errors in determining efficiency or the dose of medicine to be introduced into lungs, the sprayer must be calibrated for different medicines. A mathematical model for an atomizer design is included.

1079 APTIC NUMBER 11965

Goehring, M. and I. Darge
A PROCESS FOR DETERMINING SULFATE IN THE PRESENCE OF SOME DISTURBING CATIONS. (Ein Verfahren zur Bestimmung von Sulfat bei Anwesenheit einiger stoerender Kationen). Z. Anal. Chem., vol. 125:180-184, Nov. 9, 1942. 10 refs. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 9p.

A method is described for separating disturbing cations, such as Ca(II), Fe(III), Al(III), or Cr(III), from a sulfate-containing solution by means of a synthetic resin exchanger. Resins which are themselves strongly acid because they contain aromatic nuclear sulfo acid groups and can therefore exchange metal ions for hydrogen ions appear especially suitable for this purpose, as in the reversible reaction CaSO4 plus H2 exchanger yields H2SO4 plus Ca exchanger. Sulfate solutions can be completely freed from disturbing cations by filtering them over the exchanger, provided the solution is not too strongly acid (pH value of at least 1.5). The sulfate ion is not retained by the exchanger in quantities which can still be detected by the usual analytical methods. Separation by this technique is rapid and convenient and of satisfactory accuracy.

1080 APTIC NUMBER 12341

Gruenewald, Gerhard, Olga Simonova, and Otto D. Creutzfeldt
DIFFERENTIAL EEG-ALTERATIONS DURING VISUOMOTOR AND COGNITIVE TASKS. (Differentielle EEG-Veraenderungen bei visuomotorischen und kognitiven Taetigkeiten). Arch. Psychiat. Nervenkrankh. (Berlin), vol. 212: 46-49, 1968. 34 refs. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 34p., May 1, 1969.

An investigation is described of the variables which may produce changes in brain-wave patterns on electroencephalograms (EEG) during mental activity and periods of selective attention in humans. The EEG's of the precentro-central (PC) and occipito-temporal (OT) areas were recorded with telemetry, and their changes during six standardized visuomotor and two cognitive tasks were compared with the EEG during rest with open eyes. Automatic EEG analysis on the principle of zero-crossing and interval analysis was used. The EEG changes during tasks differed significantly in the PC and OT areas, and showed a dependence both on individual

factors (type of resting EEG with the eyes open) and on the characteristics of the tasks. On the other hand, they were not correlated with the degree of attention or concentration involved in the performance of each task. Detailed data analysis produced evidence of a differentiation between EEG reactions to different tasks. The PC alpha-rate showed the least decrease during cognitive tasks, while the OT alpha-rate showed the highest tendency towards activation during maze drawing with direct or mirror image control. The occipital beta-activation was lowest during writing without visual control. (Author abstract modified)

1081 APTIC NUMBER 17361

Guichon, Daniel and Germaine Lonaglio
THEORETICAL STUDY OF THE SPECTRUM OF THE L SPLITTING OF NITROUS OXIDE IN THE STATE J EQUALS 1. (Etude theorique du spectre de dedoublement e de l'oxyde nitreux dans l'etat J equals 1). Text in French. Ann. Sci. Univ. Besancon, Phys. (Besancon), 3(12): 12-18, 1969. 8 refs.

The spectrum of l splitting of the linear triatomic nitrous oxide molecule (represented symbolically as Nsub1-Nsub2-O) is theoretically calculated. The interaction between the rotational and vibrational modes of motion raises the degeneracy in l of the level of the degenerate transverse vibration. This results in two series of energy levels which are, in turn, decomposed by hyperfine interaction. The energy levels, the allowed transitions, and the intensities of the lines of the spectrum of l splitting were determined. The latter is analogous to the splitting of energy levels of a symmetrical top due to a slight asymmetry. In the case of the lowest frequency mode for which the vibrational quantum number v sub z equals 1, the rotational quantum number j equals 1 and the angular momentum l equals + 1 or - 1, the energy levels are: w equals (g(l)h(v sub z + 1)j(j+1))/2, where g(l) is the l splitting constant and the rotational frequencies are: nu equals (2B+or-(g(l)(v sub z+1) j))/2).(j+1) - 4D (j+1) ((J+l) squared - l squared where B and D are constants. After deriving the general relationship for the hyperfine structure of levels 1, the energy values computed for N2O molecule are represented schematically. The calculated spectrum is used to form the 'principle of spectroscopic stability'. This spectrum has a large number of transitions, the frequency difference of which is of the order of 100 kHz for the most intense ones, so that they should be capable of observation by the molecular jet method.

1082 APTIC NUMBER 16883

Halstead, W. D. and E. Raask
THE BEHAVIOUR OF SULPHUR AND CHLORINE COMPOUNDS IN PULVERIZED-COAL-FIRED BOILERS. J. Inst. Fuel, 42(344):348-349, Sept. 1969. 14 refs.

Laboratory experiments and probe tests in boilers have been made to study the decomposition of pyrite, the evaporation of sodium chloride and the formation of sulfates in the flue gas of pulverized-coal-fired boilers. The results have been compared with theoretical predictions made on the basis of thermodynamic calculations. In large boilers where there is good mixing of the fuel and combustion air it is shown that the conversion of chloride to sulfate is complete when the flue gas leaves with only trace amounts of chloride. Initial deposits on the furnace tubes will contain significant amounts of chloride and pyrite residues when there is either a localized deficiency in oxygen, or a particularly short residence time of sulfur and chlorine compounds in the flame. (Author's Abstract)

1083 APTIC NUMBER 12134

Hauser, Thomas R.
DIETHYL-4-NITROANILINE(2,6-). Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, Community Air Pollution Program, 4p., 1958 (?). 1 ref.

In an attempt to find a diazonium salt that would react in a 1:1 ratio with phenols present in the air, the following compounds were prepared: 2,6-diethyl-p-tosylaminobenzene; 4-nitro-2,6-dietyly-p-tosylaminobenzene, and 4-nitro-2,6-diethylaniline. The visible, ultraviolet, and infrared spectra of the compounds were obtained. Attempts to isolate the diazonium fluoborate of the 4-nitro-2,6-diethylaniline compound were not successful. As shown by tabulated ultraviolet spectral data, the result must be due to the strong effect of the ethyl groups. The data in the table definitely prove that nitration of the 2,6-diethyl-p-tosylaminobenzene compound takes place in the 4-position.

1084 APTIC NUMBER 17383

Hentz, Robert R. and D. B. Peterson
GAS-PHASE PHOTOLYSIS AT 1470 A OF MIXTURES OF CYCLOHEXANE WITH BENZENE AND WITH NITROUS OXIDE AT 750 TORR. J. Phys. Chem., 74(6): 1395-1396, March 19, 1970. 11 refs.

The formation of H2 in the 1470-A gas-phase photolysis of c-C6H12-C6H6 and c-C6H12-N2O mixtures was studied at 750 torr and at 95 deg. The results show no evidence of energy transfer from c-C6H12 to the potential acceptor N2O and demonstrate that H2 formation cannot occur from the same excited state of cyclohexane in both the gas and liquid photolysis at 1470 A. Presumably, H2 formation in the gas phase occurs from that state of cyclohexane produced by absorption of a 1470-A photon and H2 formation in the liquid phase from a lower, longer-lived state of excitation. It is concluded that both liquid and vapor emissions are molecular origin with the upper state being strongly prediossociated in the vapor above approximately 7.7 e V.

1085 APTIC NUMBER 12366

Hinds, W. T.
ON A GENERAL RELATION BETWEEN AUTOCORRELOGRAMS AND VARIANCE. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, vol. II: Physical Sciences, Part 3. Atmospheric Sciences, Battelle-Northwest, Richland, Wash., Pacific Northwest Lab., p. 120-127, Oct. 1968. 6 refs.
CFSTI: BNWL - 715

Statistics of randomly fluctuating variations are a source of insight into atmospheric motions and behavior. One facet of these statistics is the behavior of statistical parameters when the random variable is subject to smoothing before the statistics are calculated. Smoothing may be the inadvertent result of the sluggishness of instruments used to measure turbulent parameters. Alternatively, smoothing may be imposed by low-pass filters, so that the distribution of energy in the turbulent fluctuations can be systematically studied. One general expression for the autocorrelogram is expressed in terms of the variances of the smoothed and unsmoothed signal and the autocorrelogram. This relation, which was developed by considering the spectrum of the fluctuations, has the advantage of yielding the autocorrelogram by calculation of variances rather than by the more awkward autocovariances. However, second derivatives are difficult to handle in the absence of an analytical function. A new approach is presented to calculate the variance of an increasingly smoothed variable that leads to workable results with simple equations. The approach provides a useful tool for working with complex functions and relations.

1086 APTIC NUMBER 17376

Horvath, F. and E. Szucs
SIMILARITY CRITERIA OF DUST-FLUID FLOW. Acta Tech. Acad. Sci. Hung., 66(1-3):39-46, 1969. 2 refs.

A system of equations is developed for the flow of dust-gas mixtures; existing models for the similarity transformation of the equation system are applicable only in the case of monodisperse dust aggregations. A similarity criterion is developed that allows acceptance of overall particle distribution for modeling. Mass density and the resulting floating velocity of the dust aggregation are considered. The dust flow can be modelled exactly without any special conditions and arbitrary restrictions. The model makes it possibe to use dust of different distribution when the average density of the initial dust and the floating velocity of the aggregation are known.

1087 APTIC NUMBER 16859

Horvath, Helmuth and Robert J. Charlson
THE DIRECT OPTICAL MEASUREMENT OF ATMOSPHERIC AIR POLLUTION. Am. Ind. Hyg. Assoc. J., 30(5):500-509, Sept.-Oct. 1969. 18 refs.

The optical measurement of the mass concentration of atmospheric aerosol is influenced by size distribution, particle refractive index, particle density, and particle shape. Recent experiments indicate that a nearly linear relationship exists between light-scattering coefficient and mass concentration. Theoretical calculations and experiments relating mass concentration and light scattering as functions of the above variables are presented. The conclusion is in agreement with observations and suggests that in most cases a range of +90% to -50% accuracy in the mass/light scatter ratio can be expected, owing to known variations in the pertinent aerosol properties. (Author's Abstract)

1088 APTIC NUMBER 11685

Israel, Gerhard W.
INVESTIGATIONS OF PARTICLE BEAMS. California Inst. of Tech., Pasadena, W. M. Keck Lab. of Environmental Health Engineering, 45p., Oct. 1967. 16 refs.

Beams of polystyrene latex, silica, and tungsten oxide particles with diameters from 0.013 to 1.3 micron were generated by the continuous nozzle expansion of an air-particulate mixture. A convergent nozzle with a throat diameter of 157 micron and capillaries of different lengths but the same inner diameter were used. The particles were collected from the beam on microscope cover glasses coated with silicone oil or on mesh electron microscope grids with formvar or carbon substrates. Tests with WO3 aerosols of 0.013 diameter revealed that about 75% of the particles striking carbon coated grids rebounded. The attachment probability was increased to over 93% when the grid was coated with silicone oil. The width, intensity, and velocity of the beam were investigated experimentally as a function of the source pressure, particle size, and nozzle geometry. A method of correlating the data for the beam width as a function of source pressure and particle size is offered for the capillary. Without collimation, minimum expansion angles of about 0.0001 sr and particle velocities of 190 m/s were achieved. The possibility of aerodynamically focusing particles of a narrow size range is suggested by the experiment results for the convergent nozzle. Such a beam would provide an experimental tool for the measurement of particle-surface accommodation coefficients and for coagulation and scattering studies of crossed particle beams. (Author abstract modified)

1089 APTIC NUMBER 11616

Jones, Peter F.
ON THE USE OF PHOSPHORESCENCE QUENCHING FOR DETERMINING PERMEABILITIES OF POLYMERIC FILMS TO GASES. Aerospace Corp., El Segundo, Calif., Materials Science Lab., AF Contract F04695-67-C-0158, SAMSO-TR-68-239, 10p., May 1968. 22 refs.
CFSTI, DDC: AD 671527

The use of optical luminescence was investigated for determining the permeability of a polymeric film to gas when the gas is able to quench the phosphorescence of a polymer additive. In this method, very thin polymer films are exposed to an oxygen environment, and the lifetime of the phosphorescence of a polymer additive is measured as a function of the oxygen pressure. On the assumption that the shortening of the lifetime is due to steady-state diffusional quenching, a plot of the rate constant for decay vs the pressure of oxygen yields the permeability of the polymer to oxygen. Unlike time-lag methods, the technique is reliable in the cases of relatively large or relatively small permeabilities. From the oxygen quenching of the phosphorescence of naphthalene additive, the permeability of polymethylmethacrylate to oxygen was calculated as 1.1 plus or minus 0.2 times 0.0001 sq cu reciprocal sec reciprocal mole reciprocal mm.

1090 APTIC NUMBER 12439

Kabanov, M. V.
ATTENUATION OF COLLIMATED LIGHT BEAMS IN DISPERSIVE MEDIA. Izv. Vysshikh Uchebn. Zavedenii Fiz., vol. 8:26-30, 1967. 5 refs. Translated from Russian by F. Dion, Foreign Technology Div., Wright-Patterson AFB, Ohio, Translation Div., 7p., May 15, 1968. CFSTI, DDC: AD 679802

The effect of singly and laterally scattered light on the attenuation of collimated light beams in turbid media was investigated. Formulas were obtained for corrections to the exponential law of attenuation when the angle of vision of the receiver and the angle of divergence of the source are identical. Regions were found in which the corrections are significant for the propagation light beams in haze, fog, and rain. The region of solid angles in which angular dependence of scattered light can be disregarded was determined by the inequality) rho times omega is less than or equal to 1.1, where rho is the Mie parameter. The solid angle, omega, determines the divergence of the light beam, which in this case is equal to the angle of vision of the receiver. (Author abstract modified)

1091 APTIC NUMBER 11946

Kautsky, H. and O. Neitzke
SPECTRA OF EMISSION-CAPABLE SUBSTANCES DURING EXCITATION BY LIGHT AND CHEMICAL REACTIONS. Z. Physik, vol. 31:60-71, 1925. 13 refs. Translated from German. 17p.

The spectra of the chemiluminescence and fluorescence of fresh and old silicone were studied photometrically in the ratio of 1:1. Small pieces of calcium silcide were poured into a large beaker glass with a large amount of fuming hydrochloric acid. The mixture was allowed to stand in cold water for 6-7 hours. Subsequently, it was diluted with 5-6 volumes of water. The silicone was siphoned off and boiled with water for one-half hour. After repeated siphoning, the silicone was decanted to separate it from impurities such as silicon and iron silicide and mixed with about 9% HCl. Potassium permanganate was added in the dark for luminiscence. The fluorescence of the silicone was evoked by irradiation with ultraviolet light. The maxima of the comparable chemiluminescence and fluorescence spectra are equal. The spectra of the fluorescence of rhodamine B and fast eosin and the spectra of the chemiluminescence of the 2 pigments which occur if the adsorbates themselves are oxized on extinguished silicone with KMnO4 were photographed and underwent photometery. The comparable photometer curves of the fluorescence and chemiluminescence of the pigment are the same. The absorption spectra of rhodamine and fast eosin during the passage of the light of silicone luminescence through a solution of these pigments are completely different from the spectra of the pigment luminescence. The same emission is observed at chemiluminescence and fluorescence which indicates that the difference stems only from the different type of excitation. The results support the theory that chemiluminescence can be brought about by the transfer of energy from reacting molecules to non-reacting emission-capable molecules. This transfer of energy is not due to radiation.

1092 APTIC NUMBER 11821

Klug, W.
THE GOVERNING EQUATIONS OF THERMAL CONVECTION IN A COMPRESSIBLE FLUID. In: Notes on the Theoretical Basis of the Equations for the Atmosphere's Surface Layer. Environmental Science Services Administration, Oak Ridge, Tenn., Inst. for Environmental Research, TN-IEPTH-AIDL 7, p. 1-11, Nov. 1967.

Approximations are presented for equations of motion, continuity, and energy in the case of thermal convection in a compressible fluid. The simplified form, commonly known as the Boussinesq approximation, is the starting point for most theoretical discussions of turbulence in the atmospheric surface layer. Conditions for simplification are that the vertical dimensions of the considered fluid are much smaller than any of the scale heights and the fluctuations of pressure and density do not exceed in order of magnitude the variations of the status part of these quantities.

1093 APTIC NUMBER 18006

Kneen, T. and W. Strauss
DEPOSITION OF DUST FROM TURBULENT GAS STREAMS. Atmos. Environ., 3(1):55-67, Jan. 1969. 23 refs.

When a gas stream containing small suspended particles moves past a surface, particles may be deposited at the surface. A mathematical expression for the deposition rate is derived and the experimental basis for it is discussed. Recent ideas about the deposition of small particles from turbulent flow in smooth tubes are reviewed. Fluid flow close to the wall, inertia of particles, and Brownian diffusion are among parameters to be considered. Deposition of particles from a turbulent gas stream is of interest in such fields as air pollution control, health physics, and micrometeorology.

1094 APTIC NUMBER 17346

Kortuem, G. and H. Quabeck
STUDIES OF THE REACTIONS OF GASEOUS NO AND NOCL WITH METAL OXIDE SURFACES WITH THE AID OF IR-REFLECTANCE SPECTROSCOPY. I. (IR-reflexionsspektroskopische Untersuchungen der Wechselwirkungen von gasfoermigen NO und NOCl mit Metalloxidoberflaechen. I). Text in German. Ber. Bunsenges. Physik. Chem., 73(10):1020-1027, 1969. 36 refs.

By use of reflectance spectroscopy in the near infrared, the reactions of gaseous NO and NOCl with the surfaces of pulverized silica gel, Al2O3, SiO2-Al2O3, MgO, and CaO were studied. Because of its electron-donor-acceptor qualities, NO was a useful adsorbent to determine the surface conditions of the oxides. Knowledge of the adsorbate spectra NO + oxide helps to interpret the spectra of the NOCl adsorbed on the surface of the metal oxides. In part I, the adsorption of NO is discussed. The NO was obtained by dropping sulfuric acid into sodium nitrite which was covered with water. It was washed with 4N KOH solution and dried over P2O5. Bands of medium intensity were observed at about 2250/cm. It was assumed that with silica gel, Al2O3, and SiO2-Al2O3, the bands formed by interaction of NO with strained oxygen bridges the surfaces at which process Me (metal)-O(-) and

Me...N(triple band)O+ developed. For cubic MgO and CaO, however, the mentioned bands could be related to an interaction with Me(2+) O(2-)-groups of the surface. Additional bands were found with Al2O3 and SiO2-Al2O3 at longer wavelengths which indicates bonding of NO to a Lewis-acidic Al atom of the surface.

1095 APTIC NUMBER 18021

Kovetz, A.
AN ANALYTICAL SOLUTION FOR THE CHANGE OF CLOUD AND FOG DROPLET SPECTRA DUE TO CONDENSATION. J. Atmospheric Sci., 26(2):302-304, March 1969. 6 refs.

The process of droplet growth by condensation of water vapor on condensation nuclei is described by a partial differential equation for the spectrum n(r,z,t). Solutions of this equation are given for a few simple cases which are of interest in connection with clouds and fogs. (Author's Abstract)

1096 APTIC NUMBER 17330

Lesnikowitsch, A. I., J. Scheve, and I. Ebert
SEMICONDUCTION AND CATALYSIS. VI: SO2-OXIDATION ON CR2O3-ZRO2 OXIDE MIXTURES WITH SPECIAL CONSIDERATION OF THE HIGHER DEGREES OF OXIDATION OF CHROMIUM. (Halbleitung und Katalyse. VI: SO2-Oxydation an Cr2O3-ZrO2-Mischoxiden unter besonderer Berucksichtigung hoeherer Oxydationsstufen des Chroms). Text in German. Z. Anorg. Allgem. Chem., vol. 370:40-48, 1969. 12 refs.

The catalytic properties of 10 samples of chromic oxide and zirconium oxide mixtures with 0.0 to 16.4 mole % Cr2O3 were determined using the process of oxidation of sulfur dioxide to sulfur trioxide at 450 C in a gas mixture containing initially 7 volume % SO2 as a catalytic test reaction. Of the test data, only those relating to degrees of conversion up to 20% were used to compute for each sample the reaction rate constants k', in cm/hr, and the apparent activation energy of the reaction, AE, in kcal/mole, characterizing its catalytic activity. Both quantities are plotted as functions of the mixture composition. The electric conductivity of the 10 samples were measured using a method described in the paper. The measured values were used to determine the activation energy of electric conductivity, E(sigma) in eV, which gives an energy value for the charge carriers characterizing the interaction of the electrons with the absorbed gas molecules and is plotted as a function of the mixture composition. The apparent activation energy, AE was found to be related linearly on the relative intensity of the electron spin resonance, but differently, depending on the presence or absence of free Cr2O3 in the mixture. The catalytic and electronic properties of Cr2O3 + ZrO2 mixtures were most directly related to, respectively, the Cr(5+) ion concentration and the ratio Cr(5+)/Cr(3+). The catalytic activity may be explained by an electron-collision mechanism, while the lowering of the apparent activation energy of electric conductivity may be reviewed as due to a charge-exchange ('hopping-exchange') between Cr(5+) and Cr(3+) ions.

1097 APTIC NUMBER 12343

Liao, Hsueh-liang
SURFACE PROPERTIES OF A SILICA GEL TREATED WITH PHENYL TRICHLOROSILANE AND ITS COMPARISON WITH AN UNTREATED SILICA GEL: A FLOW STUDY. Drexel Inst. of Technology, Philadelphia, Pa., Dept. of Chemical Engineering, Thesis (MS), June 1969, 60p. 17 refs.

The selective adsorption properties of a silica gel treated with phenyl trichlorosilane were determined in a flow system and compared to those of an untreated silica gel. Selective adsorption between hexane and water vapor was in favor of water vapor as compared to the untreated silica gel, contrary to published patent information. Proportions of hexane and water in the adsorbed phase are functions of the adsorption time. Also a higher approaching velocity of the vapor mixture gives higher water content in the adsorbed phase. The overall effect of the treatment of silica gel is not desirable for sampling vapors in systems where selective water removal is desired. (Author abstract)

1098 APTIC NUMBER 11783

Liu, Benjamin Y. H. and Hsu-Chi Yeh
EFFECT OF PRESSURE AND ELECTRIC FIELD ON THE CHARGING OF AEROSOL PARTICLES. (SECTION III). Minnesota Univ., Minneapolis, Dept. of Mechanical Engineering, AEC Contract AT(11-1)-1248, Pub. COO-1248-13, 57p., Sept. 1967. 12 refs. (Presented at the International Conference on the Universal Aspects of Atmospheric Electricity 4th, Tokyo, Japan, May 13-18, 1968.)

The electric charge acquired by particles of an aerosol containing unipolar gaseous ions was measured over a wide range of conditions. Monodisperse aerosols of Di-octyl phthalate with surface median radii from 0.026 to 0.565 micron were used. Pressure was varied from 0.075 atm to 0.96 atm, the intensity of the applied electric field was varied from 372 volts/cm to 2000 volts/cm, and the product N(o)t was varied from approximately 400,000 to 30,000,000, where N(o) is the concentration of ions in number of ions per cc of air, and t is the charging time in seconds. The experimental data were compared with various charging theories previously reviewed by Liu and Yeh and the results indicated that none of the theories gave an entirely satisfactory account of the experimental data over its entire range. However, the best agreement was obtained with the theory of Liu and Yeh, thus indicating that this theory gives an essentially correct description of the charging process. (Author abstract modified)

1099 APTIC NUMBER 11784

Liu, Benjamin Y. H. and Hsu-Chi Yeh
ON THE THEORY OF CHARGING OF AEROSOL PARTICLES IN AN ELECTRIC FIELD. Minnesota Univ., Minneapolis, Particle Technology Lab., AEC Contract Pub. COO-1248-12, 32p., Sept. 1967. 12 refs.

Theories for the charging of aerosol particles by unipolar gaseous ions were reviewed and a new theory taking into account both the random thermal motion of the ions and the motion of ions induced by an applied electric field was developed. The theories were

compared with the experimental data of Hewitt; the results indicated that the new theory developed shows the best agreement with the experimental data over the entire range of conditions covered by the data, for particle size ranging from 0.09 to 0.46 micron radius, for electric field intensities ranging from 300 volts/cm to 10800 volts/cm, and for product N(o)t, ranging from approximately 1,000,000 to 50,000,000, where N(o) is the concentration of ions in number of ions per cc, and t is the charging time in seconds). The methods of predicting the magnitude of electric charge acquired by aerosol particles are of considerable practical importance in the design and operation of devices such as electrostatic precipitators, electrostatic aerosol samplers, electrogasdynamic power generators, and aerosol particle counters and classifiers based on electrostatic principles. (Author abstract modified)

1100 APTIC NUMBER 17333

Marecek, J., K. Nocek, and M. Erdos
KINETICS OF THE REACTION BETWEEN THE SOLID SODIUM CARBONATE AND THE GASEOUS SULPHUR DIOXIDE. IV. EFFECT OF THE GAS PHASE COMPOSITION AND OF TEMPERATURE IN AN INTEGRAL FIXED-BED REACTOR. Collection Czech. Chem. Commun. (Prague), 35(1)154-164, Jan. 1970. 9 refs.

The reaction rate between the solid sodium carbonate and sulfur dioxide was studied in an integral fixed bed reactor. The gas containing 0.1 mol % sulfur dioxide contained, in addition to nitrogen, variable concentrations of water vapor, carbon dioxide, and oxygen. The presence of water vapor in the gas was necessary for a rapid and complete reaction. A conversion of the solid up to 98% was achieved. An increase in the reaction rate was not observed after increasing the partial pressure of the water vapor above 5 Torr. The presence of carbon dioxide in the gas had no observable effect on the reaction. The presence of oxygen decreased the reaction rate over the whole reaction. The negative effect of oxygen was significant at temperatures above 160 C. The kinetics of the reaction were described in the temperature range 120-160 C. It was not possible to obtain values for the rate constants in the range 120-180 if the gas did not contain oxygen. The reactivity of sodium carbonate offers a possibility for removing sulfur dioxide from gases present in low concentrations. (Author conclusions modified)

1101 APTIC NUMBER 12339

McCormick, N. P. and J. D. Lawrence, Jr.
TABLES OF MIE SCATTERING FUNCTIONS FOR PARTICLES WITH REFRACTIVE INDEX 1.5. National Aeronautics and Space Administration, Langley Station, Hampton, Va., Langley Research Center, NASA TN D-5110, 54p., March 1969. 13 refs.

Single-particle backscatter intensity functions and efficiency factors for spherical particles of refractive index 1.5 were calculated by using rigorous Mie theory. The single-particle results were integrated over a Junge size distribution at four laser wavelengths for a range of parameters representative of the atmospheric aerosol. The laser wavelengths are 1.0600, 0.6943, 0.5300, and 0.3472 micron, corresponding to the output of a neodymium laser and ruby laser and their second harmonics, respectively. The Junge size-distribution parameters 2.50, 3.00, 3.50, and 4.00 and particle radii limits of approximately 0.04 to 3.00, 0.04 to 10.00, 0.08 to 3.00, and 0.08 to 10.00 micron were used. (Author abstract modified)

1102 APTIC NUMBER 11601

Mills, A. P., W. E. Denny, Y. C. Wu, J. MacDonald, A. Wortman, and M. Hion
NUMERICAL ANALYSIS OF CHEMICAL REACTING FLOWS. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39. p. 17-26, Sept 1968. 12 refs.

Computer programs were devised for the analysis of the following chemically reacting flow situations: two-dimensional boundary-layer flow; steady state, two-dimensional elliptic flows; multicomponent diffusion; and mixed equilibrium and nonequilibrium chemical reactions. The programs will be used to investigate the flame quenching problem of automobile exhausts, the possibility of reducing automotive exhaust emissions by air injection, and methods of destabilizing inversion layers.

1103 APTIC NUMBER 11689

Murray, J. D.
ON EQUATIONS OF MOTION FOR A PARTICLE-FLUID TWO PHASE FLOW. Preprint, Michigan Univ., Ann Arbor, 37p., 1967 (?). 27 refs.

General equations of motion for the flow of a particle-fluid two phase system of any voidage were derived from the Maxwell-Boltzmann equation. The general equations for identical particles differed from those previously suggested by various authors. A detailed discussion was given of the interaction terms in the equations and of the role of a particulate stress tensor. It was suggested and demonstrated that, in most situations, a particulate bulk viscosity and a particulate collision term have similar effects and that use of the bulk viscosity only is suggested. Approximate equations of motion were suggested for various flow situations such as those occurring in aerosol motions and fluidized states. The effect of varying voidage was included throughout. (Author summary modified)

1104 APTIC NUMBER 12449

Nobuo, M.
THE PROBLEMS OF ODOR NUISANCE. I. ODORS AND LIFE. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 2(1): no pagination given, 1967. Translated from Japanese. 14p.

Certain odors are categorized as natural or artifical, and the characteristic smell of each odor is noted. The chemical structure of several odors is shown, including methionine, L-tryptophan, L-lysine, L-arginine, and allium.

1105 APTIC NUMBER 17370

Noxon, J. F.
OPTICAL EMISSION FROM O(1D) AND O2(b1 SIGMA G) IN ULTRAVIOLET PHOTOLYSIS OF O2 AND CO2. J. Chem. Phys., 52(4):1852-1873, Feb. 1970. 24 refs.

The presence of O(1D) was detected by 6300 A emission in ultraviolet photolysis of O2 and CO2. The uv source was a xenon discharge lamp at several hundred torr pressure which emitted a continuum down to 1470 A. The light intensity of the lamp was measured with a thermopile. The output of the reaction was detected by a 9558 A photomultiplier. Quenching rates for O(1D) and O2(1 sigma g) were measured for O2, N2, CO2, and CO. Quenching of O(1D) by O2 yields O2(1 sigma g) with nearly unit probability. The quenching rates compared well with those deduced from day airglow emission from the upper atmosphere; however a much smaller quenching rate by CO2 on O(1D) was found than that by earlier workers who used less direct methods. Photolysis of O2-CO mixtures lead to optical emission which exhibited a pronounced periodic variations in time. The quenching coefficients for O2, N2, CO2 and CO, in order, were as follows (ccm/sec): for O(1D), K1 equals 6 times 10 to the minus 11th power; k2 equals 9 times 10 to the minus 11th power; k3 equals 3 times 10 to the minus 12th power; k4 is less than 5 times 10 to the minus 11th power; and for O2 (1 sigma g) k5 equals 1.5 times 10 to the minus 16th power; k6 equals 2 times 10 to the minus 15th power; k7 equals 3 times 10 to the minus 13th power; and k8 equals 3 times 10 to the minus 15th power. (Author abstract modified)

1106 APTIC NUMBER 16479

Pecqueur, Michel
THE SEPARATION OF URANIUM ISOTOPES. (La separation des isotopes de l'uranium). Text in French. Ann. Mines Belg., no.11:658-676, Nov. 1963. 17 refs.

A systematic review of the production of enriched uranium is presented, including a brief historical account of the developments in the United States. The four methods of separation of uranium isotopes which have been studied extensively but have not led to satisfactory industrial applications are described as follows: electromagnetic separation, thermal diffusion, centrifugation, and detention by an orifice. The method of gaseous diffusion is described with respect to the following: theoretical basis, the cascaded diffusion, an ideal cascade, enrichment and impoverishment cascades, and the step cascade. The method of computation of an optimal plant is illustrated. The following theoretical problems are discussed: the flexibility of the plant, the kinetics of changes of concentrations in the successive gaseous diffusion stages, the aerodynamic stability of the plant, the starting of the process, the electric stability of the plant, and the separation of several isotopes. The practical aspects of the process are considered as follows: the physical and chemical properties of UF6, the only uranium compound which is gaseous at low temperatures; the barrier material; the compressor for UF6 and its gas-tightness; the size of the installations; and the risks of the critical mass of enriched uranium.

1107 APTIC NUMBER 18025

Pitts, J. N., Jr., Ahsan U. Khan, E. Brian Smith, and Richard P. Wayne
SINGLET OXYGEN IN THE ENVIRONMENTAL SCIENCES. SINGLET MOLECULAR OXYGEN AND PHOTOCHEMICAL AIR POLLUTION. Environ. Sci. Technol., 3(3):241-247, March 1969. 70 refs.

Singlet molecular oxygen may play a significant role as an oxidant in photochemical air pollution. Reaction of electronically excited oxygen with olefinic substances produces thermally unstable hydroperoxides which may be involved in the rapid conversion of NO into NO2, a process not well understood in photochemical air pollution. Several mechanisms for the formation of singlet molecular oxygen are examined critically in relation to their possible importance in the chemistry of urban atmospheres. In each, the excitation energy is derived ultimately from the sun's radiation, but the energy may be utilized by direct absorption of radiation by ground state atomic oxygen, by photolysis of an atmospheric contaminant to form excited singlet molecular oxygen in the primary step, by spin-conserved energy transfer mechanism in which an atmospheric contaminant absorbs solar radiation and transfers its excitation to ground state atomic oxygen, or by exothermic chemical reactions involving atmospheric contaminants which themselves originated in a photochemical process. (Author's Abstract)

1108 APTIC NUMBER 11796

Pullman, Ira
FREE RADICAL PRODUCTION IN BIOLOGICALLY SIGNIFICANT COMPOUNDS. In: Biological Effects of Radiation and Related Biochemical and Physical Studies. (Progress Report). Sloan-Kettering Inst. for Cancer Research, New York, Div. of Biophysics, AEC Contract AT(30-1)910, 2p., Sept. 30, 1968.

A method is described for obtaining values of the hyperfine coupling constants of the negative ions of selected polycyclic hydrocarbons of biological interest. The electron spin resonance spectra of these compounds are too complex to be completely resolved, so it is difficult to assign unambiguous coupling constants based on comparison with a theoretical stick program in which the lines have zero width. In an experimental program, a simulated Lorentz line shape experimental spectrum is being computed by an IBM 1800 from a given set of coupling constants. The natural line width, the modulation amplitude of the spectrometer, and the output time constant of the spectrometer are taken into account. The method reduces the ambiguity in the assignment of coupling constants. Experimental and calculated hyperfine coupling constants for benzo(a)pyrene negative ion are tabulated. The data to be obtained for different hydrocarbon negative ions will serve as a check on various semi-empirical correlations between spin densities and coupling constants reported for the simpler hydrocarbons.

1109 APTIC NUMBER 11881

Reamer, H. H., Joan Jacobs, and B. H. Sage
OSCILLATORY COMBUSTION AT ELEVATED PRESSURE. MONOCHROMATIC AND TOTAL OPTICAL INTENSITY. California Inst. of Tech., Pasadena, Chemical Engineering Lab., NAPCA Grant AP-00108-08, 24p., 1969 (?). 10 refs.

Measurements of perturbations in radial stress and in monochromatic and total intensity for the combustion of air and natural gas at three mixture ratios lying between 0.8 and 1.0 at pressure of approximately 40 lb/sq in. abs. are presented. Moreover, comparisons were made with earlier data and the results are presented in graphical and tabular form. The combustor employed for the experiments consisted of an oil-cooled copper chamber 1.0 in. in diameter and approximately 24 in. in length. Mixtures of air and natural gas were introduced through a group of supersonic nozzles. Dilution ratios of approximately 4 to 1 were employed. Perturbations in radial stress were measured by means of a condensor-type commercial transducer the response of which was nearly linear at frequencies below 10,000 cycles per second. The perturbations in total and monochromatic optical intensity were obtained by means of a collimator and a photosensitive element. The oscillations were typically about 500 Hz. The extinction perturbation at 1.95 micron was 5%, and at 1.45 micron, 4%. The standard deviations were between 30 and 40% of the total perturbation.

1110 APTIC NUMBER 12215

Rudinger, George
RELAXATION IN GAS-PARTICLE FLOW. Cornell Aeronautical Lab., Inc., Buffalo, N. Y., ONR Contract N00014-67-A-0226-0005, NR-098-038, Proj. SQUID, TR CAL-96-PU, 81p., July 1968. 46 refs.
CFSTI, DDC: AD 675500

Flow of gas-particle mixtures may exhibit significant relaxation effects if the particle velocity and temperature cannot follow rapid changes in the flow conditions. Relaxation phenomena were demonstrated in a discussion of viscous drag and heat transfer for a single particle which has no effect on the gas flow. If there are enough particles to make up a significant fraction of the mass of the mixture, the thermodynamic properties of the mixture may differ considerably from those of the gas alone; a number of these properties were derived. Equations for one-dimensional flow of uniform mixtures were applied to shock waves, steady nozzle flows, and general nonsteady flows to illustrate the relaxation processes. For low and moderate particle concentrations, the volume occupied by the particles can often be neglected. Since this assumption may not be adequate for high concentrations, some effects of a finite particle volume were also discussed. There are many engineering applications for flows of a medium that consist of a suspension of powdered material or liquid droplets in a gas. A typical example is the flow in rockets that use a solid propellant to which aluminum powder is added for the purpose of improved flame stability and heat release. As a result, small solid particles of aluminum oxide are formed which must be exhausted with the rest of the combustion gases. Other examples occur in connection with some nuclear reactors, fuel sprays, air pollution, and conveying of powdered materials. (Author summary modified)

1111 APTIC NUMBER 12413

Saffman, P. G.
AN APPLICATION OF THE WIENER-HERMITE EXPANSION TO THE DIFFUSION OF A PASSIVE SCALAR IN A HOMOGENEOUS TURBULENT FLOW. Rand Corp., Santa Monica, Calif., Contract DAHC15 67 C 0141, RM-5711-ARPA, 42p., Oct. 1968. 16 refs.
CFSTI,DDC: AD 677201

The velocity and concentration fields in a homogeneous turbulent flow convecting a passive scalar were expanded in series of Wiener-Hermite functionals. The equations of motion lead to integro-differential equations for the coefficients of expansion. The expansion and the equations were truncated at the first stage that gave nontrivial results, and analytical solutions were obtained for the concentration field with the velocity field given and with zero molecular conductivity. Diffusion from the point source was considered first. The mean concentration satisfies an integro-differential equation with diffusive and wave-like properties, which reduces for large time-values to the diffusion equation in accordance with the classical theory of G. I. Taylor. The effective diffusivity was determined in terms of Eulerian velocity correlations. The spectrum of a statistically homogeneous distribution was considered second. If the spectrum is initially concentrated around the wave number of the energy-containing eddies, an equilibrium is established for larger wave numbers. Combined with a modification of Batchelor's theory of the spectrum for very large wave numbers to include small-scale intermittency, an equation was used to predict the decay rate of the concentration intensity. (Author summary modified)

1112 APTIC NUMBER 11696

Sage, B. H.
FORMATION OF OXIDES OF NITROGEN DURING COMBUSTION AT ATMOSPHERIC PRESSURE. OSCILLATORY COMBUSTION AT ATMOSPHERIC PRESSURE. (SUMMARY REPORT). California Inst. of Tech., Pasadena Chemical Engineering Lab., Ms 4237, 79p., 1968 (?). 43 refs.

Studies on the mechanism of oscillatory combustion are reported, especially as related to residual quantities of nitrogen oxides in the products of combustion at atmospheric pressure. The experimental investigation was limited to studies of the combustion of air and natural gas over a wide range of mixture ratios and flow rates. Perturbations in normal stress were found at frequencies from 700 to 1100 cycles per sec and involved a series of standing waves. Abrupt changes in frequencies were encountered, due to the change in the number of standing waves, when mixture ratios were changed. Marked changes in the intensity of the perturbations were encountered with progressive changes in the effective length of the combustor. For small ranges of length, virtually quiet combustion was realized. Residual quantities of nitrogen oxides, including nitric oxide and nitrogen tetroxide, were markedly influenced by the intensity of the perturbations; residual quantities were as much as a hundred times those encountered under quiet combustion conditions. Perturbations in monochromatic and total optical intensity were measured and the frequencies were found to be the same as the frequency in normal stress. Because of the strong reducing action of carbon monoxide on nitrogen oxides, the quantities of residual nitrogen oxides decreased rapidly in the presence of carbon monoxide. The data

obtained suggest that the combustion of air and natural gas should be carried out under conditions so that perturbations in normal stress at frequencies between 500 and 1000 cycles per sec can be reinforced from the primary combustion area.

1113 APTIC NUMBER 12450

Santner, Joseph F.
AN INTRODUCTION TO WEIBULL PROBABILITY PAPER. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Urban and Industrial Health, 29p., 1961 (?). 3 refs.

The use of probability paper for graphical manual analysis of frequency type data is illustrated. Graphical manual analysis is practical not only in the study of new products and processes, but as a means of obtaining rough estimates of population parameters. As demonstrated, these parameters are easily obtained by plotting data on Weibull paper and drawing the regression line of best fit.

1114 APTIC NUMBER 11826

Sawyer, Robert F.
FUNDAMENTALS OF COMBUSTION. Preprint, Calif. Univ., Berkeley, Dept. of Mechanical Engineering, 38p., 1967 (?). 36 refs.

The fundamentals of combustion which include the laws of thermodynamics, stoichiometry, thermochemistry, reactants and reaction products, and adiabatic flame temperature are presented. Pertinent laws of thermodynamics and basic thermodynamic definitions and concepts are briefly reviewed, including the equation of state, work, heat, the first and second law of thermodynamics, heat capacity, enthalpy, internal energy, and the Helmholtz and Gibbs functions. Complex equilibria effects of equivalence ratio, pressure, and temperature are also discussed. Adiabatic flame temperatures for a number of reactants are presented. The discussion of combustion is based upon the assumption of the attainment of thermodynamic equilibrium in the combustion process. The model was useful and valid in predicting energy release, flame temperature, and limiting composition of combustion product mixtures.

1115 APTIC NUMBER 16886

Schaefer, Vincent J.
THE INADVERTENT MODIFICATION OF THE ATMOSPHERE BY AIR POLLUTION. Bull. Am. Meteorol. Soc., 50(4):199-206, April 1969. 16 refs.

There has been a very noticeable increase in air pollution during the past ten years over and downwind of the several large metropolitan areas of the U. S. such as the northwest--Vancouver-Seattle-Tacoma-Portland; the west coast from San Francisco-Sacramento-Fresno-Los Angeles; the front range of the Rockies from Boulder-Denver-Colorado Springs-Pueblo; the midwest--Omaha-Kansas City-St. Louis-Memphis; the Great Lakes area of Chicago-Detroit-Cleveland-Buffalo; and the northeast--Washington-Philadelphia-New York-Boston. The worst accumulation of particulate matter occurs at the top of the inversion which commonly intensifies at night at levels ranging from 1000 to 4000 ft. or so above the ground. This dense concentration of air-suspended particles is most apparent to air travelers. Thus, it has not as yet disturbed the general public except during periods of stagnant weather systems when the concentration of heavily polluted air extends downward and engulfs them on the highways, at their homes and in their working areas. (Author's Abstract)

1116 APTIC NUMBER 16978

Seyer, W. F. and W. F. Cornett
THE SYSTEM SULFUR DIOXIDE-DECALIN. Ind. Eng. Chem., 29(1):91-92, Jan. 1937. 2 refs.

The thermal data of the mixture decalin-sulfur dioxide was obtained. The bulb method was used for determining the freezing points and temperatures at which the two liquids disappeared. The critical solution temperature was 41.8 C. The shape of the freezing point curve indicates the presence of a ternary system and a difference in the solubility of the two forms of decalin. (Author abstract modified)

1117 APTIC NUMBER 17350

Shifrin, K. S., I. B. Kolesnikov, and V. I. Chernyshov
ON THE COMPUTATION OF THE PARTICLE SIZES OF A DISPERSE SYSTEM FROM DATA ON ITS TRANSPARENCY. Bull. Acad. Sci. USSR, Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 5(10):625-627, Oct. 1969. 6 refs.

A method of determining the particle spectrum of a disperse system was previously developed, based on the reduction of data on its spectral transparency. A new standard working formula which is more suitable than that previously published was developed. The physical basis of the method is the connection between the spectral transparency of the system and the size of its constituent particles. Gamma-structures were used to illustrate the formula.

1118 APTIC NUMBER 12249

Slinn, W. G. N.
THE CONVECTIVE DIFFUSION EQUATION FOR THE SCAVENGING OF SUBMICRON PARTICLES. In: Pacific Northwest Laboratory Annual Report for 1967 to the USAEC Division of Biology and Medicine, Volume II: Physical Sciences, Part 3. Atmospheric Sciences. Battelle - Northwest, Richland, Wash., Pacific Northwest Lab., p. 171-183, Oct. 1968. 12 refs.
CFSTI: BNWL - 715

A method is described by which the stochastic force on a Brownian particle can be calculated using Markoff's method. This limited the results to the regime Kn (Knudsen number) greater than 1. Although it was assumed that the particle was stationary and in an equilibrium environment, these are not essential assumptions. The description of the fluctuating force on a stationary sphere

was derived; Epstein's drag coefficient was obtained from information that is available when the sphere is at rest. Alternatively, if the drag coefficient is known, for specular reflection of the molecules, equipartition is a consequence of and need not be a postulate for the motion of a Brownian particle. In addition to the drag coefficient, the diffusion coefficient and the mobility for a particle were obtained. All are in agreement with experimental results of with results obtained by alternate theoretical analysis.

1119 APTIC NUMBER 18015

Soo, Shao L., James J. Stukel, and J. Martin Hughes
MEASUREMENT OF MASS FLOW AND DENSITY OF AEROSOLS IN TRANSPORT. Environ. Sci. Technol., 3(4):386-393, April 1969. 8 refs.

Accurate methods for determination of the local mass flow and density of aerosol particles in a suspension include differential isokinetic sampling with a correction of depletion, and fiber optic measurement of the density of particles. These two probes can be combined into a single probe. Within the capability of the filters used, there is no lower limit for isokinetic sampling; the lower limit of fiber optics probe was 0.015 kg/sqm. The average charge to mass ratio of a particle cloud can be determined using the same sampling probe. (Author's Abstract)

1120 APTIC NUMBER 12142

Stevenson, H. J. R., D. E. Sanderson, and A. P. Altshuller
SOME EFFECTS OF SULFUR DIOXIDE ON FORMATION OF PHOTOCHEMICAL AEROSOLS. Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 14p., 1964. 13 refs. (Presented at the Conference of the American Industrial Hygiene Association, Philadelphia, Pa., April 29, 1964.)

Aerosol was photochemically produced by the irradiation of a number of hydrocarbon-nitrogen dioxide mixtures, some requiring sulfur dioxide. In the reactions not requiring sulfur dioxide, the addition of SO2 increased the aerosol production. Trans-2-butene required SO2 for aerosol production, but cyclohexene did not. When both hydrocarbons were present in the photochemical reaction with NO2, the amount of aerosol was greater than that produced by the cyclohexene alone. The cyclohexene appeared to perform a role for the trans-2-butene similar to the role played by sulfur dioxide. Six- and seven-carbon olefins, whether cyclic or straight chain, all produced aerosols without the presence of SO2 and produced more aerosol when SO2 was added. It appeared reasonable that 3-heptene produced less aerosol than the 1-heptene in the absence of SO2 because of the smaller molecular fragment on reaction. The 3-heptene reacted more rapidly than the 1-heptene because of the internal position of the double bond, and the increase of aerosol on addition of SO2 was greater for 3-heptene than for 1-heptene. Shorter wavelength illumination had little effect, an indication that photochemical activation of SO2 is not responsible for its ability to react in photochemical smog production. At 50% humidity, less aerosol was produced than at 0%, and the length of residence time had opposite effects on the quantity of aerosol produced, depending upon the speed of the reaction. The size of the aerosol produced depended upon the conditions of the experiment. When sulfur dioxide was present, the aerosol was smaller and more numerous.

1121 APTIC NUMBER 12247

Taplin, G. V., T. Isawa, and K. Wasserman
COMBINED INHALATION-PERFUSION SCANNING AND PULMONARY FUNCTION STUDIES IN CHRONIC OBSTRUCTIVE AIRWAY DISEASE. In: Semiannual Progress Report for the Period Ending December 31, 1968. California Univ., Los Angeles, Lab. of Nuclear Med. and Radiation Biology, AEC Contract AT(04-1) GEN-12, p. 16-18, 1969.
CFSTI: UCLA 12 - 706

Fifty patients were studied by combined inhalation-perfusion scanning, radiography, and complete pulmonary function studies including blood gas analysis. The proposed project to establish the validity and clinical usefulness of scanning procedures in emphysema and related obstructive airway diseases. Preliminary analysis and correlations between scan and pulmonary function data demonstrate that scans aid in detecting these types of emphysema patients who are most likely to respond satisfactorily to medical treatment. They also appear useful in following the patients response to treatment.

1122 APTIC NUMBER 12203

Titt, Edwin W.
ON THE PREDICTOR CORRECTOR SCHEME FOR THE DIGITAL SOLUTION OF THE PARTIAL DIFFERENTIAL EQUATION OF ATMOSPHERIC DIFFUSION. Sandia Corp., Albuquerque, N. Mex., Symp. Theory Measurement Atmospheric Turbulence Diffusion Planetary Boundary Layer, Albuquerque, N. Mex., 1967, p. 74-84. 17 refs. (Dec. 5-7.)

The range and accuracy of a computer program for the predictor corrector solution of the partial differential equation of atmospheric diffusion from a line source was extended. The problem was solved in slices proceeding in a downwind direction, each slice requiring a matrix reduction. The equations of the system were the integrated conditions of Green taken over vertical strips of elements. The original equation was written so that the linearized terms carry the main burden, giving a predictor so accurate that little iteration is required. The idea of using two approximating nets when the demands of accuracy require a vertical step size too small for a stable process was introduced. One is a coarse net for the determination of the matrix and values of the solution at points of the fine net are computed from Green's formula in an over-determined fashion using boundary values coming from the coarse solution. The fine results were then used to improve the accuracy of the corrector for the coarse solution. (Author abstract modified)

1123 APTIC NUMBER 18051

Troll, Walter
THE ROLE OF ANALYTICAL CHEMISTRY IN CARCINOGENESIS STUDIES. Anal. Chem., 41(3):22A-26A, 28A, 30A, March 1969. 40 refs.

In chemical carcinogenesis studies, biologists hope to find species with fast responses to carcinogenic agents; molecular biologists (modern chemists) hope to find a mechanism for the disease to clarify what materials are dangerous; the analytical chemist hopes to measure these materials and support the proposed mechanism. This review traces the problem from the point of view of each of these scientists. Mechanism of chemicals as cancer agents, identification of specific chemicals, repressed vs expressed genetic information, promoting agents are aspects of the problem that are discussed. (Author's Abstract, Modified)

1124 APTIC NUMBER 11802

Uhaas, R. S., S. A. Lesko, Jr., and P. O. P. Ts'o
CHEMICAL LINKAGE OF THE 3,4-BENZPYRENE TO DNA VIA FREE RADICAL REACTION. (A PRELIMINARY REPORT). AEC Contract AT(30-1)-3538, NYO-3538-11, Conf.-681016-2, 6p., March 1, 1968. 3 refs.

A linkage between 3,4-benzpyrene (BP) and DNa was successfully induced by iodine. Chromatographic analysis of the nucleotides produced by hydrolysis of the BP-DNA complex indicated that a majority of the counts followed the optical density, although there was a radioactivity peak in the fractions which came through with the void volume. Since most of the counts were removed by cyclohexane, they are not chemically linked to the nucleotides. It is hypothesized that the BP-DNA bond may be base labile, and thus cleaved by the alkaline conditions needed for enzymatic hydrolysis. This would lead to a free BP derivative in aqueous solution, far above its aqueous solubility, and the formation of microcrystals or colloidal particles. At present, the nature of the BP-DNA reaction product is not clear. Preliminary sucrose gradient electrophoresis studies on the nucleotide mixture indicates several components. One very strong peak of radioactivity is found to migrate closely with the guanosine monophosphate, suggesting that a reaction analogous to alkylation of DNA occurs and involves the 7-position of guanine. In future experiments, the role of free radicals in the reaction will be followed by electron spin resonance.

1125 APTIC NUMBER 18042

Uhaas, R. S., Stephen A. Lesko, Jr., and P. O. P. Ts'o
CHEMICAL LINKAGE OF CARCINOGENIC 3,4-BENZPYRENE TO DNA IN AQUEOUS SOLUTION INDUCED BY PEROXIDE AND IODINE. Nature, 221(5182): 763-764, Feb. 22, 1969. 10 refs.

The origin of the biological specificity of polycyclic hydrocarbons has long confronted investigators interested in carcinogenesis. The formation of a 3,4-benzpyrene-DNA covalent linkage in an aqueous, neutral solution, at 0 - 50 degrees C, was induced by peroxide and iodine. Little or no 1,2-benzpyrene-DNA chemical complex formation was found in identical conditions. It was possible therefore to correlate the chemical reactivity of this pair of isomers in this aqueous system with their carcinogenicity. The experimental basis of the study is discussed.

1126 APTIC NUMBER 12227

Wells, A. C. and A. C. Chamberlain
TRANSPORT OF MICRON-SIZED DROPLETS TO VERTICAL SURFACES. Atomic Energy Establishment, Harwell (England), Health Physics and Medical Div., BHRC/P17, 6p., Feb. 1965. 4 refs.
CFSTI: BHRC P-17

An experimental deposition apparatus was constructed to study the transport of micron-sized tricresyl phosphate particles, tagged with P-32, to vertical surfaces. The objective of the work was to gain information on the deposition of particles on smooth and rough surfaces (in reactors and heat exchangers, at ground surfaces, and in the human respiratory tract). Experimental results for the transport of the particles are shown in curves of transport velocity vs friction velocity. Friedlander and Johnstone's impaction theory adequately predicted the deposition velocities at higher friction velocities. However, the results low friction velocities were two orders of magnitude more than would be predicted by the impaction theory alone. Deposition to roughened surfaces (medium knurled surfaces) differed from that of smooth surfaces (paper covered surfaces and reactor fuel can elements) by several orders of magnitude. The filter paper surface was aerodynamically smooth at the wind speed used, while the knurled and fuel can surfaces were transitional between aerodynamically smooth and rough character. It appears, therefore that no formula containing merely the characteristics of the fluid flow will predict the transport to a rough surface. Surface characteristics which do not affect the fluid flow can affect the transport of micron-sized particles.

1127 APTIC NUMBER 12216

Wells, Michael B.
MONTE CARLO ANALYSIS OF SEARCHLIGHT SCATTERING MEASUREMENTS. Radiation Research Associates, Inc., Fort Worth, Tex., OAR Contract F19628-67-C-0298, Proj. 7621, Task 762107, Unit 76210701, AFCRL-68-0311, RRA-TR7, 17p., May 31, 1968. 5 refs. (Presented at the Annual Meeting of the Optical Society of America, 1967, Paper ThD 20.)
CFSTI, DDC: AD 675153

A Monte Carlo analysis was made of measurements of the scattered light from a searchlight beam. These measurements, reported by Elterman, were performed to determine the aerosol properties of the atmosphere for altitudes below 35 km. Elterman derived altitude profiles of the aerosol attenuation coefficient from the measured response data by use of single scattering theory for Rayleigh and aerosol particle scattering. A study was made using the LITE-I Monte Carlo code to investigate the effects of multiple scattering and ozone absorption on the measured response date for 0.55 micron wavelength light. The effect on the calculated receiver response that results from the use of different aerosol phase functions in the Monte Carlo calculations was also studied. The Monte Carlo calculations showed that the effects of multiple scattering and ozone absorption were approximately equal in magnitude, but opposite in effect. It was concluded, that the neglect of ozone absorption and multiple scattering did not introduce any significant error in Elterman's calculations of the aerosol attenuation coefficient profiles. The major source of error in determining the aerosol attenuation coefficient profile from single scattering theory was found to be in the use of an

aerosol phase function that was measured at a different time and geographical location than that used for the searchlight experiment. (Author abstract modified)

1128 APTIC NUMBER 17364

Wickert, K.
TESTS ON FORMATION OF FECL2 AND FECL3 BY REACTIONS BETWEEN FE, FE3O4, FE2O3 AND HCL-CONTAINING GASES. (Versuche zur Bildung von FeCl2 und FeCl3 aus Fe, Fe3O4, Fe2O3 und HCl-haltigen Gasen). Text in German. Mitt. Ver. Grosskesselbesitzer, 49(6):449-52, Dec. 1969. 5 refs.

The reaction of hydrogen chloride containing gases with pulverized Fe, Fe3O4, and Fe2O3 was studied with respect to temperature. Moreover, the influence of water vapor and oxygen in the HCl-containing gases on the raction with the above mentioned substances was studied with respect to temperature. For each experiment, 0.3 g of the pulverized substances were heated in the presence of pure nitrogen. Each experiment lasted 4 hours. The HCl-containing gas (100 cu cm/min) was passed with a speed of 0.44 cm/sec through the reaction chamber at a temperature of 22 C. The reaction products were cooled to room temperature and the weight changes of the substances were determined. The reaction of Fe2O3 with N2 containing 5% by volume HCl forms FeCl3. The fraction of solid FeCl3 decreases with increasing temperatures while the volatile FeCl3 increases with the temperature. Below 320 C, volatile and solid FeCl3 are formed. The reaction of Fe with the gas forms FeCl2. Above 670 C, no solid FeCl2 is found. Above 580 C, FeCl2 is increasingly sublimated. The reaction with Fe3O4 forms FeCl2 and FeCl3. The former develops primarily at low temperatures. The maximum FeCl2 formation takes place between 200 and 250 C. The FeCl3 is sublimated at 300 C. The reaction of Fe3O4 with N2 containing 10% H2O and 5% HCl forms solid FeCl2 up to 550 C. No reaction takes place between 550 and 700 C. Above 300 C, FeCl3 and FeCl2 form which are immediately converted to Fe2O3 through the influence of water vapor. The reaction with Fe forms no Fe2O3 only Fe3O4. Oxygen in the gas like the water vapor impairs the HCl reaction with Fe, Fe2O3, and Fe3O4. The presence of water vapor in addition to HCl form volatile and non-volatile chlorides but to a much lesser extend than in the presence of HCl alone in the gas. Oxygen further reduces chloride formation.

1129 APTIC NUMBER 11704

Wuerker, Ralph F.
RESEARCH ON ELECTROSTATIC CHARGED DROPLET STREAMS. TRW Systems, Redondo Beach, Calif., Contract AF 33(615)-1035, Proj. 7116, ARL 67-0211, Oct. 1967, 172p. 31 refs.
CFSTI,DDC: AD 666669

A new holographic technique was developed for recording charged particle emission from small bore needles at high electrical potentials, particularly charged glycerin jets. The process uses a submicrosecond 0.694 micron wavelength Q-switched ruby laser to record a hologram and a 0.63 micron continuous wave helium neon laser to reconstruct an aerial image from the hologram. The image can be examined in detail with a conventional short working distance microscope. Photographs taken through the microscope at proper focal positions are then assembled in a montage to yield a two-dimensional representation of the recorded high-speed event. The process overcomes the depth of field and working distance limitations of a conventional magnifying system. In addition to microscopy, holography is capable of making three-dimensional interferometric measurements. The charged particle emission of glycerin from electrified metal capillaries takes the form of long micron diameter electrically unstable charged filaments. The instabilities are primarily of the 'kink' and 'sausage' modes, but a 'length extension' instability is found whenever the stream is acclerated in a nonuniform electric field. The 'kink' instability is dominant, with the stream eventually breaking up into droplets. As a consequence, it is concluded that the charge-to-mass ratio of the stream is determined while it is still intact and not by the droplet formation process.

1130 APTIC NUMBER 11959

Zocher, H. and H. Kautsky
LUMINESCENCE DURING CHEMICAL REACTIONS. Naturwissenschaften (Berlin), vol. 11:194-199, 1923. 10 refs. Translated from German. 14p.

Chemiluminescence of the silicalhydroxide Si2O2H2 was studied and the simultaneous occurrence of fluorescence was established. Studies of temperature effect from 100 C to -86 C were made. The chemiluminescence as well as fluorescence is explained on the basis of quantum considerations. Studies were made of the chemiluminescence reaction of oxydisilin with potassium permanganate as revealed through the fluorescence of a number of attendant pigments.

1131 APTIC NUMBER 16898

Albert, R. E., M. Lippmann, and W. Briscoe
THE CHARACTERISTICS OF BRONCHIAL CLEARANCE IN HUMANS AND THE EFFECTS OF CIGARETTE SMOKING. Arch. Environ. Health, 18(5): 738-755, May 1969. 14 refs.

The clearance of radioactive monodisperse ferric oxide aerosols ranging in diameter from 0.8micron to 7.9micron was studied in a total of 117 experiments on 36 subjects. In most normal subjects there were two discrete periods of bronchial clearance, with the first usually completed within one to two hours, and the second within four to ten hours after inhalation. The fraction cleared in each phase was strongly dependent on the size of the inhaled particles, with more first phase clearance for larger particles. The rates of bronchial clearance were expressed in terms of the time required for completion of 50% to 90% bronchial clearance. On the basis of the limited data thus far accumulated, bronchial clearance was impaired in eight out of fourteen cigarette smokers, three out of three former uranium miners, and two out of two emphysema cases. (Author's Abstract)

1132 APTIC NUMBER 11947

Bencko, V.
ARSENIC IN HAIR OF PROFESSIONALLY NOT EXPOSED POPULATION. (Arzen vo vlasoch neprofesionalne exponovanej populacie). Cesk. Hyg. (Prague), 11(9):539-543, 1966. 14 refs. Translated from Czech. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services; 10p.

Excessive air pollution by arsenic was observed in the area of a thermal power plant. The hair of ten-year old boys living in the vicinity of the plant was tested for arsenic content in a study of the feasibility of using arsenic hair determinations as indicators of nonprofessional exposure. As normal values of arsenic content in children's hair were not available, the obtained values were compared with the values of a control group of ten-year old boys from a village where arsenic levels fell within a normal range. In both areas, a comparatively broad scatter span of arsenic values was observed. However, the average value for the boys from the polluted zone was 3 1/2 times higher than that for the boys from the unpolluted area. The increased content of arsenic in hair is attributed to increased amounts of arsenic in vegetables and fruit as a result of soil contamination and to direct hair contamination by flue dust.

1133 APTIC NUMBER 18036

Berlin, Mats, Jerry Fazackerley, and Gunnar Nordberg
THE UPTAKE OF MERCURY IN THE BRAINS OF MAMMALS EXPOSED TO MERCURY VAPOR AND TO MERCURIC SALTS. Arch. Environ Health, 18(5): 719-729, May 1969. 8 refs.

Rats, rabbits, and monkeys were exposed to mercury vapor (1 mg/cu m) for four hours, and uptake and distribution of mercury in the brain was compared with that of animals injected intravenously with the same dose of mercury as mercuric salts. Vapor-exposed animals showed a brain content about ten times higher than the injected animals. The results indicate that the higher uptake in brain following vapor exposure is a general phenomenon in mammals. (Author's Abstract)

1134 APTIC NUMBER 11379

Bushtueva, K. A.
TOXICITY OF SULFUR OXIDES INHALATION IN CHRONIC CONTINUOUS EXPERIMENT. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 16: 82-98, 1966. 15 refs. (B. S. Levine, ed.)
CFSTI: PB 179141

An investigation of the effects on white mice of prolonged (65 days) uninterrupted inhalation of different concentrations of sulfur dioxide and sulfuric acid aerosols, alone and in combination, are reported. The H2SO4 aerosol particles were less than 2 micron diameter. The following indices of resorptive effects of the sulfur compounds were studied: behavior and course of weight changes; muscle antagonists chronaxy ratio changes; changes in whole blood cholinesterase activity; changes in blood serum protein fraction ratios; rate of coproporphyrine elimination with the urine; and pathomorphological organ and tissue changes in sacrificed animals. It is concluded that prolonged uninterrupted inhalation of air containing a mixture of SO2 and H2SO4 aerosol effects the organism synergistically. A formula is proposed as a guide in evaluating the sanitary condition of the atmospheric air of inhabited areas which contains SO2 gas and H2SO4 aerosol simultaneously: a/n plus b/n greater than 1, where a is the actual SO2 concentration found; n, its official 24-hr average Maximum Allowable Concentration; b, the actual H2SO4 aerosol concentration found; and n, its official 24-hr average MAC.

1135 APTIC NUMBER 12402

Carson, Steven and Richard E. Goldhaber
BIOCHEMICAL DEFENSE MECHANISMS AGAINST PULMONARY IRRITANTS. Food and Drug Research Labs., Inc., New York, Contract AF 33(615)-5309, Proj. 7163, AMRL-TR-67-212, 130p., Oct. 1968. 20 refs.
CFSTI, DDC: AD 680823

Studies were performed in which mammalian mucociliary apparatus was characterized under normal conditions following exposure to three irritant gases: 100 percent oxygen, ozone and nitrogen dioxide. Investigations were made in normal and treated animals providing physical, electrophysiological, biochemical, and morphologic data of effects due to exposure. A method for in vitro microscopic observation of viable cilia and adjacent mucus blanket was described in terms of ciliary beat and movement of particles embedded in the mucus. In vitro volumetric estimation of mucus thickness was compared to electrical resistance measurements in the attempt to provide an in vivo method to determine mucus depth alterations in treated animals. Polarographic studies of oxygen dependent enzymes were carried out on pooled stripped epithelial tissue of untreated animals and comparison

made with tissues exposed to ozone and nitrogen dioxide. Exposure to 100 per cent oxygen caused a significant but self-limiting decrease in mucus velocity and viscosity. Acute exposure to nitrogen dioxide (35 and 75 micrograms per kilogram) caused marked dose dependent changes in velocity and viscosity. Exposure to 0.5 ppm ozone for a 14 day period resulted in general mucostasis and elevated viscosity levels. (Author abstract modified)

1136 APTIC NUMBER 16849

Chan, Po Chuen, F. Kingsley Sanders, and Ernest L. Wynder
EFFECT OF 3,4-BENZO(a)PYRENE ON MOUSE LUNG PRIMORDIA IN VITRO.
Nature, 223(5208):847-848, Aug. 23, 1969. 13 refs.

Organ cultures of mammalian lung primordium can acquire essentially all the adult cellular elements together with their chemical characteristics. Several chemical carcinogens have been shown to induce neoplastic development in mouse lungs in vivo. This study shows that 3,4-benzo(a)pyrene interferes with the normal development and differentiation of mouse lung buds in vitro.

1137 APTIC NUMBER 11371

Eliseeva, D. B.
THE BIOLOGICAL EFFECT OF LOW CARBON CONCENTRATIONS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 16:5-17, 1966. 28 refs. (B. S. Levine, ed.)
CFSTI: PB 179141

As determined by encephalograms recorded for seven individuals 18-45 years of age, inhalation for even a brief period of time of air containing 0.1 and 0.5% of carbon dioxide produces well-defined changes in vascular blood flow rates and the functional state of the brain cortex. Consequently, the air of living quarters should not contain more than 0.1% carbon dioxide, while average 24-hr carbon dioxide concentrations should not exceed 0.05%, regardless of the source.

1138 APTIC NUMBER 17374

Gage, J. C.
THE SUBACUTE INHALATION TOXICITY OF 109 INDUSTRIAL CHEMICALS.
Brit. J. Ind. Med. (London), 27(1):1-18, Jan. 1970. 29 refs.

The inhalation toxicity of 109 industrial chemicals was studied by exposing pathogen-free rats to known concentrations in air for periods of about three weeks. The toxic properties were determined by biochemical and hematological tests, followed by microscopic examinations of lungs, livers, kidneys, spleen, and adrenals, and occasionally heart, jejunum, ileum, and thymus. The investigation was undertaken to provide information to aid in plant design and in the establishment of safety precautions to prevent occupational disease when the materials are produced or used in manufacturing processes. Based on the experiments, provisional operation limits are presented for the materials which include hydrocarbons, chlorinated hydro-carbons, ethers, esters, alcohols, aldehydes and ketones, acids, amines, nitriles, organic phosphorus compounds, organic peroxides, silicon compounds and sulfur compounds. Details of the experiments undertaken and the results obtained are presented according to the following scheme: atmospheric concentration and method of generation; number, sex, and species of animals; number and duration of exposures; clinical observations; and autopsy.

1139 APTIC NUMBER 16879

Gardner, Murray B., Clayton G. Loosli, Bernard Hanes, William Blackmore, and Dixie Teebken
HISTOPATHOLOGIC FINDINGS IN RATS EXPOSED TO AMBIENT AND FILTERED AIR. Arch. Environ. Health, 19(5):637-647, Nov. 1969. 27 refs.

There is no significant difference in life span or weight at death of rats living in ambient vs filtered Los Angeles atmosphere; nor is there any discernible histologic effect upon lung tissue following prolonged exposure of rats to ambient Los Angeles atmosphere. There appears to be a more abrupt increase in the incidence of chronic nephritis male rats in ambient air, commencing at about 650 days of age, and the overall incidence of advanced chronic nephritis at spontaneous death is significantly greater in male rats exposed to ambient air. These findings raise the possibility that exogenous factors in the Los Angeles atmosphere may promote the development of this renal degenerative disease. (Author's Abstract)

1140 APTIC NUMBER 11806

Gindi, Gene and Caron Moran
TEST OF A BIOLOGICAL MODEL FOR SMOG INDUCED DEATH. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 33-50, 1968. 12 refs.

A mathematical model which links smog-induced deaths to the genetic theory of aging was tested by application to two New York smog episodes and by comparison with the results obtained when the model was applied to the London smog episode of 1952. In the model, death rates were considered to form a fraction of the original population of a particular age group dying in a given interval of time. Therefore, it was necessary to calculate the population of each group at birth. Therefore, a weighted mean age was assigned to a certain age group by weighting each age according to the population of that age in a city at the time of a smog episode. With the population of an age group, and the specific death rate known for a particular year, the cohort population at birth was calculated. Mortality rates were expressed in terms of cohort deaths, and were used to compute the background death rate for each age group. The values obtained for New York were in good agreement, but differed significantly from the London values. It is concluded that they reflect differences in public health levels as well as the effect of contaminants on human biological functioning.

1141 APTIC NUMBER 12292

Gotmekler, V. A., N. N. Pushkina, and G. N. Klevtsova
SOME BIOCHEMICAL ASPECTS OF THE EMBRYOTROPIC EFFECT OF BENZENE AND FORMALDEHYDE. (Nekotorye biokhimicheskie sdvigi pri izuchenii embriotropnogo deistviya benzola i formal'degida). Hyg. Sanit., 33(7-9):112-116, July-Sept. 1968. 3 refs.

The biochemical effects of inhaled benzene and formaldehyde in the developing rat embryo were investigated. Sexually mature females were exposed for the entire period of pregnancy to benzene in concentrations of 63.5, 56.6, 20.4, 5.6, and 1 mg/cu m., and to formaldehyde in concentrations of 1 and 0.012 mg/cu m. Both substances even in low concentrations caused significant biochemical changes in both pregnant females and fetuses. An increase in concentration raised the requirement for ascorbic acid and thus reduced its concentration in the organs of female and fetus. Formaldehyde in both the investigated dosages had a significant inhibitory effect on the synthesis of nucleic acids, including DNA.

1142 APTIC NUMBER 16880

Gross, Paul, William E. Rinehart, Henry P. Smyth, Jr., and Katherine J. Burton
MORPHOLOGIC CRITERIA OF PULMONARY EDEMA. Arch. Environ. Health, 19(5):663-665, Nov. 1969. 6 refs.

The usual morphologic criterion of alveolar edema is the presence of homogeneous acidophilic material in the air spaces. When interstitial pulmonary edema is present, it is often assumed that alveolar edema is associated even though there may not be any demonstrable proteinaceous material in the air spaces. Findings in rat lungs are described that serve as additional criteria of alveolar edema. These are separations of surface epithelium from the alveolar septum to form blebs and larger clear spaces on the alveolar wall, finally resulting in castoff membranes completely free in the air spaces. (Author's Abstract)

1143 APTIC NUMBER 18046

Hursh, J. B., A. Schraub, E. L. Sattler, and H. P. Hofmann
FATE OF 212Pb INHALED BY HUMAN SUBJECTS. Health Phys., 16(3): 257-267, March 1969. 18 refs.

Ten human subjects inhaled 212Pb carried on natural aerosols. Deposition in the lung varied from 14 to 45% of the amount inhaled. Clearance from the lung to the systemic tissues occurred with an estimated half-time of 6.5 hr. The average 24-hr urinary excretion of 212Pb was 2.8 plus or minus 0.15% of the body content. The total loss by fecal excretion adjusted to zero time averaged 3% body content. The 212Pb absorbed from the lungs into the blood is in part fixed by the circulating red cells and in part distributed to other tissues. The red cell 212Pb burden grows to a steady state level which averages 50% of the total body burden. The results are interpreted to indicate that the clearance of radon daughters from the lung parenchyma by absorption into the blood has little dosimetric significance, whereas, in the case of thoron daughters, the average lung dose is reduced to less than half. (Author's Abstract)

1144 APTIC NUMBER 12344

Kapalin, V.
OSSEOUS AGE - ITS EVALUATION AND THE NORMAL DEVELOPMENT OF OSSEOUS MATURATION IN CZECH CHILDREN OF PRE-SCHOOL AND SCHOOL AGES. (Kostni vek - jeho hodnoceni a normalni postup kostniho zrani u ceskych deti predskolniho a skolniho veku). Cesk. Hyg. (Prague), 12(5):233-245, 1967. 36 refs. Translated from Czech. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 20p.

Osseous age is defined as the period in human life during which bones increase in size and become mature. A total of 2424 x-ray pictures of the left wrist and hand of Czech children, ages 6-16, were evaluated by the method of Greulich and Pyle. Whereas the growth of girls was comparable to those of American girls, there was a delay of about one year in Czech boys during early school years. A definite relationship was demonstrated between level of growth and osseous age. Children living in polluted areas experienced a retarded osseous maturation as compared with those living in clean-air areas. A new method was developed for evaluating osseous age, which was used to compile statistics.

1145 APTIC NUMBER 11987

Kaspar, J. and L. Tichy
THE EFFECT OF LIVING ENVIRONMENT CONTAINING EXHALATIONS ON SOME INDICES OF THE HEALTH STATE OF THE POPULATION OF THE NORTHBOHEMIAN REGION. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 143-158.

In Northern Bohemia, dust fall concentrations of 500-1000 t/sq km/yr have been recorded in areas near coal mines. Sulfur dioxide concentrations in an area comprising both mines and industry exceed 1 mg/cu m and are expected to increase. In comparison with other regions of Czechoslovakia, the population of Northern Bohemia has the shortest life expectancy. For all age groups over five years, the mortality is higher than the national average. Environmental contamination by industrial emissions is considered to be significant among the factors influencing the mortality rate of the region. As demonstrated by comparative morbidity studies, the incidence of premature fetuses in the regions's superficial coal mine basin is statistically significant, as is the incidence of nonspecific diseases of the lung and respiratory tract in children and the percentage of adults hospitalized due to severe forms of pulmonary and respiratory tract diseases. Children in localities polluted by dust and sulfur dioxide exhibit a reduction in the volume of individual blood cells, accompanied by an increased erythrocyte count. Retared skeletal development is pronounced among children 7 to 12 years of age.

1146 APTIC NUMBER 17381

Kaave, Bengt
CLINICAL AND EXPERIMENTAL STUDIES ON THE EFFECTS OF INTRAOCULAR

METALLIC FOREIGN BODIES WITH SPECIAL REFERENCE TO RETINAL FUNCTION. Forsvaisnedlan, vol. 6:3-8, Jan. 1970. 13 refs.

Recordings of the slow electric potentials generated in the retina in response to illumination are valuable for the evaluation of functional damage in the eye. This technique was used to observe the metallotic changes caused by metallic foreign bodies lodged in 68 eyes for at least 10 days. A striking variation was found in the development of metallotic changes from case to case. Several observations indicated that the nature and localization of the particle were not the only reason for such variation. Most of the particles were located in the vitreous. Some of these particles were encapsulated in one way or another. Encapsulated iron particles were observed only in eyes where the particles had remained from 3 to 28 years. Moderate signs of siderosis were noted in these eyes and the ERG indicated a varying degree of damage to the retina. Even minor differences in alloy content appeared to influence the development of siderosis bulbi. The electroretinographical and ophthalmological changes following the implantation of iron, steel, copper, and aluminum particles in the vitreous were studied in the rabbit. Iron particles were encapsulated soon after implantation. After about a week, the capsule began to resorb; and after a varying time period, the particles 'reappeared.' A temporal correlation between the RG changes and the formation and resorption of the capsule was demonstrated. Slow, progessive ERG changes following the implantation of iron particles were tentatively interpreted as results of slow progressive retinal atophy due to siderosis. In the steel implantation experiments, the effect of alloy content on the development of siderosis bulbi was demonstrated. The encapsulation reactions to steel alloys differed from those to iron particles; only a thin coating developed, covering parts of the particles. The slowly developing negative ERG obtained in rabbit after the implantation of moderately corrosive particles, i.e., aluminum and some steel particles, suggests that the development of different types of ERG in metallosis bulbi depend on local conditions in the retina and the amount and rate of toxic ions reaching the retina.

1147 APTIC NUMBER 12191

Dokuchaeva, P. V. and N. I. Skvortsova
BIOLOGICAL EFFECT OF EXPERIMENTAL INHALATION OF LOW MANGANESE CONCENTRATIONS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 16:98-104, 1966. 16 refs. (B. S. Levine, ed.)
CFSTI: PB 179141

Pure-bred white rats (9 males and 16 females) were exposed to manganese dust in an experimental inhalation chamber. Two series were conducted, each paralleled by a control series. The manganese dust consisted of 95% MnO2 dried at 100 C and ground to contain 82% of particles with a diameter of less than 5 micron. The rats were exposed to dust inhalation 5 to 6 hours daily for 6 months (first series) and for 7 months (second series). The MnO2 concentration in the air was 0.302 mg/cu m in the first series and 0.033 mg/cu m in the second series. Dust inhalation under the conditions of the first experimental series elicited pulmonary changes in the form of pulmonary tissue inflammation, disturbance of the pulmonary vascular system, and slight peribronchial and pericircular sclerosis of the pulmonary tissue. The second series of experiments elicited in female rats shifts in the albumin/globulin blood serum protein ratios. The lungs of both the male-female rats showed the presence of fine foci of MnO2 dust accumulations. Inhalation of air containing an average of 4.12 mg/cu m of MnO2 dust for a period of 5 months produced porphyrinuria in experimental male rats, a rise in whole blood cholinesterase activity, and a drop in the number of erythrocytes.

1148 APTIC NUMBER 11375

Krasovitskaya, M. L. and L. K. Malyarova
LOW UNSATURATED ETHYLENE HYDROCARBON CONCENTATIONS IN THE AIR SURROUNDING OPERATING CRUDE OIL COMPLEXES (COMBINES). U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 16:44-57, 1966. 27 refs. (B. S. Levine, ed.)
CFSTI: PB179141

To determine maximum allowable atmospheric concentrations of hydrocarbons of the ethylene series, 11 human subjects were tested for odor perception thresholds to low concentrations of propylene, butylene, and ethylene; for threshold reflex effects; and for the development of electrocortical conditioned reflexes. In related experiments, five groups of 15 white rats were exposed to the hydrocarbons for 70 days and then checked for the following physiological indices: weight, behavior, muscle antagonists chronaxy ration, blood pressure, leukocytes, phagocytic index, and whole blood cholinesterase activity. The odor perception thresholds of ethylene, propylene, and butylene were found to be 15.4, 17.3, and 20 mg/cu m, respectively; the threshold of central nervous reflex activity, 13.9-14.2 mg/cu m; and the threshold concentration eliciting shifts in eye sensitivity to light, 11 mg/cu m. The threshold concentration eliciting formation of electrocortical conditioned reflexes was 4.4 mg/cu m. Hydrocarbon vapors in 100 mg/cu m caused hypotension in rats, inhibited the cholinesterase activity, and affected the controlling function of muscle antagonists chronaxy ratio. Each hydrocarbon reacted on the organism with equal intensity. In general, the physiological indices were not affected by 3 mg/cu m of the hydrocarbons, even after chronic exposure. Consequently it is proposed that the maximum allowable 24-hr concentrations of unsaturated ethylene hydrocarbons be limited to 3 mg/cu m.

1149 APTIC NUMBER 11372

Kulakov, A. E.
HYGIENIC EVALUATION OF ATMOSPHERIC POLLUTION WITH HEXAMETHYLENEDIAMINE. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 16:17-23, 1966. 30 refs. (B. S. Levine, ed.)
CFSTI: PB 179141

The odor perception threshold for hexamethylenediamine, together with the threshold concentration of the substance's reflex effect on eye sensitivity to light, was studied in four subjects placed in a special electroencephalographic chamber and exposed to varying concentrations administered in conjunction with intermittent light flashes. The odor perception threshold for sensitive persons was found to be 0.0032 mg/cu m of

hexamethylenediamine; the threshold concentration of the reflex effect, 0.0027 mg/cu m; and the threshold concentration of electrocortical sensory brain activity, 0.0017 mg/cu m. Based on these results, the author recommends that the allowable hexamethylenediamine concentration be set at 0.001 mg/cu m. This level was exceeded in 44% of 500 samples collected 500 meters distant from a plant manufacturing hexamethylenediamine salts.

1150 APTIC NUMBER 16895

LaForce, F. Marc, Forrest H. Bumford, James C. Feeley, Stewart L. Stokes, and David B. Snow
EPIDEMIOLOGIC STUDY OF A FATAL CASE OF INHALATION ANTHRAX.
Arch. Environ. Health, 18(5):798-805, May 1969. 18 refs.

An isolated case of inhalation anthrax occurred in a 46 year old white man who worked adjacent to a goat hair processing plant. The illness was characterized by three days of malaise and fatigue and the sudden development of coma followed by death on the fourth day. Autopsy revealed massive hemorrhagic mediastinal lymphadenitis and hemorrhagic leptomeningitis. Anthrax bacilli were demonstrated in tissue and recovered bacteriologically. Bacillus anthracis was cultured from machinery, from imported goat hair, and from aerosols in the goat hair mill. Bacillus anthracis was also recovered in the metal fabricator shop where the patient had worked, supporting the hypothesis that the exposure was via contaminated aerosols. (Author's Summary)

1151 APTIC NUMBER 11970

Langmann, R.
THE EFFECTS OF AIR POLLUTANTS ON SELECTED POPULATION GROUPS. (Die Wirkung von Luftverunreinigungen auf ausgesuchte Bevoelkerungsgruppen). Oeffentl. Gesundheitsdienst, 22(5):179-188, 1960. Translated from German. Franklin Inst. Research Labs. Philadelphia, Pa., Science Info. Services, 13p.

Various studies were undertaken to determine the transient effect of industrial dust on lung function. In one test, healthy male subjects averaging 25 years of age were exposed for six hours in a working area of a steel and iron foundry to 18 ppm carbon monoxide and 0.08 ppm sulfur dioxide. No worker demonstrated the onset of any acute loss of respiratory function. Only one difference was noted in MTV values as determined by the Fowler Test before the start and after the end of the working day. The difference was not statistically significant. Tests were also conducted with workers exposed to 0.24 ppm in the foundry pit. No detectable changes were recorded with respect to vital capacity, maximum expiration value, and respiratory minute volume. However, respiration rate increased by 11.9% and depth of respiration declined by 9%, suggesting that dust potentiates SO2 action. The effects of chronic exposure to dust in a study concerned with measurement of pulmonary function in a group of older persons need to be taken into account. Subjective reactions to SO2 concentrations less than 1 ppm were noted in older emphysema patients when the weather was foggy and small amounts of hydrogen sulfide were present in the atmosphere.

1152 APTIC NUMBER 16868

Lawther, P. J.
SOME CURRENT BRITISH RESEARCH ON THE MEDICAL ASPECTS OF AIR POLLUTION. Clean Air (J. Clean Air Soc. Australia New Zealand), 3(2):17-21, June 1969. 60 refs.

Research in Britain in the last 15 years has strived to know the nature of pollution in its various guises, to study its effects and to identify the noxious compounds found in town air. Chemical, physical, and optical techniques have been used. Epidemiological techniques of varying complexity have been devised to study short term variations in morbidity and mortality and long term trends which may be associated with the favorable effects of the implementation of the Clean Air Act and the improved use of fuel. A brief review of the literature summarizes the research in several categories. Under physics and chemistry are discussed the optical assessment of particulate matter, acid particles in air, studies of carcinogenic compounds, and carbon monoxide. Under the general classification of physiology, bacteriology, and histology the following subjects are reviewed: Studies of the physical properties of the lung in relation to the measurement of changes in function; studies of "acute" effects of inhalation of pollutants; studies in histology of bronchial mucosa in chemical workers; and the effects of air pollutants on lung flora and bacteria commonly to be found in sputum from chronic bronchitic patients. The applications of epidemiologic studies of the effects of air pollution are also discussed.

1153 APTIC NUMBER 11807

Litt, Robert S., Sarah Vaughan, Patti Birkinshaw, Holly Coit, and Barbara Sanders
EFFECTS OF LOW CONCENTRATIONS OF OZONE ON TEMPORAL DISCRIMINATION. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 51-64, 1968. 12 refs.

The effects of ozone on temporal discrimination and learning time in rats was investigated. Six rats were separated into two groups, as nearly equal as possible, and run on variable and fixed interval schedules, alternately in ozone and ozone-free air. The criteria for switching a rat from one schedule to another was a uniform response rate within runs, consistency between runs, and the character of the response patterns. Almost consistently, learning time decreased in ozone, whether it came between ozone-free runs or after them. The results supported the hypothesis that ozone significantly affects learning time. (Author abstract modified)

1154 APTIC NUMBER 12242

Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Fission Product Inhalation Program
LIPID ANALYSIS OF TISSUES FROM THE BEAGLE DOG. In: Annual Report of the Fission Product Inhalation Program. Sept. 1967 through Sept. 1968. AEC Contract AT(29-2)-1013, p. 202-206, Nov. 1968. 6 refs.

CFSTI: LF - 39

Tissues were obtained from four 13-month old Beagles (two male and two females) for lipid analysis. The results are presented in the orm of tables of the lipid content of 31 tissues and of the ompositionof the neutral lipids and phospholipids in the tissues. ung and tonsil lipids have a high percentage of phospholipids; rain, nasal turbinates, and kidney lipids are also rich in hosphatides. Neutral lipids predominate in adipose fat, tongue, kin, epiglottis, and abdominal lymph nodes. When compared to ther tissue lipids, brain neutral lipids are atypical in that 98% s free cholesterol, while triglycerides and sterol esters are not etectable. The brain phospholipid composition is also unusual hen compared to that of other tissues; lecithin values are lou. nformation obtained in the present investigation will be used s control data for future experiments involving a similar survey f tissue lipids from dogs exposed to radicactive aerosols.

1155 APTIC NUMBER 11378

Melekhina, V. P.
THE PROBLEM OF COMBINED ACTION OF THREE MINERAL ACIDS. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 16:76-81, 1966. 6 refs. (B. S. Levine, ed.)
CFSTI: PB 179141

The effect of the combined presence of sulfuric, nitric, and hydrochloric acid in the atmosphere was investigated by experiments on odor perception thresholds, reflex effect of the acids on eye sensitivity to light, and effect of different acid combinations on eye adaptation to darkness. The following concentrations of odor perception threshold were established: 0.70 mg/cu m for nitric acid, 0.60 mg/cu m for sulfuric acid, and 0.40 mg/cu m for hydrochloric acid; corresponding H-ion equivalents are 0.01099, 0.01203, and 0.01053 mg/cu m. Any combination of two or three acids was clearly odor perceptible if the sum of their concentration fractions in corresponding relation to their individual threshold concentrations exceeded unity. Perceptible concentrations expressed in H-ions exceed the 0.01 mg/cu m level. Threshold reflex effect concentrations, as studied by eye adaptation to darkness, were on the level of threshold odor perception, or just above it. Results of all phases of this investigation indicated that the mechanism of action when two or three mineral acids are simultaneously present in the air is one of simple summation. The results also support the assumption that the reflex effect of nitric, sulfuric, and hydrochloric acids in the atmospheric air of inhabited areas is a condition of H-ion concentration; therefore it is proposed that the sanitary-hygienic condition of atmospheric air containing mineral acids be evaluated on the basis of H-ion concentrations. It is recommended that the maximum single allowable concentration for the sum of the three acids as well as for each individually, based on the H-ion index, should not exceed 0.010 mg/cu m. (Author conclusions modified)

1156 APTIC NUMBER 11935

Morelli, A. and P. Preziosi
ACID PHOSPHATASE IN THE BRAIN DURING SUBACUTE INTOXICATION WITH TETRAETHYL LEAD. (La fosfatasi acida encefalica in corso di intossicazione subacuta con piombo tetraetile). Folia Med. (Naples), vol. 36:718-722, 1953. 3 refs. Translated from Italian. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 5p.

Brain acid phosphatase was studied in four rabbits acutely or subacutely intoxicated with tetraethyl lead. The acutely intoxicated rabbits received the toxic substance intravenously in gum arabic emulsion in doses of 60 or 90 mg Pbt/kg of body weight. The subacutely intoxicated rabbits received 10 or 50 Pbt/kg of body weight in 95% alcohol subcutaneously on 10 successive days. No significant change in the distribution of the enzyme in the various areas of the encephalon was observed between control animals and rabbits acutely and subacutely treated. Tetraethyl lead was found in the brain tissue of all animals: 4.26 mg in animals treated with 60 mg/kg; 43.57 mg in animals treated with 90 mg/kg; and 0.43 and 0.15 mg in animals treated with 10 and 50 mg/kg. The findings are considered significant, since many drugs exert an effect on brain phosphatase activity.

1157 APTIC NUMBER 11799

Morrow, Paul E.
PARTICULATE MATTER: GENERAL CONSIDERATIONS AND AEROSOL DEPOSITION IN MAN. In: Physiology in the Space Environment. Washington, D. C., National Academy of Sciences - National Research Council, 1968, Chapt. 16, p. 123-130. 21 refs.

Fundamental to all biomedical questions and problems associated with aerosols is the matter of deposition (dust removal from the air during respiration) and of retention (persistence of dust in the respiratory structure after deposition). The substantial agreement found among studies of deposition indicated that the instability forces affecting a dust particle are qualitatively identical, whether the deposition occurs outside or within the respiratory tract. Many of the experimental and theoretical relationships between respiratory tract characteristics and the physical properties of aerosols have been organized into deposition curves according to particle size. The major shortcomings of these curves is that they are based on normal respiratory patterns and fail to give a clear picture of the deposition probabilities of a dust cloud, i.e., the state of dustiness normally encountered. The curves do not describe adequately the mass distribution of aerosols, a factor important in toxicological considerations. Modifications of dust deposition under spacecraft conditions are reviewed and suggestions offered for research on aerosols in space capsules.

1158 APTIC NUMBER 11798

Morrow, Paul E.
RESPIRATORY TRACT CLEARANCE MECHANISMS FOR NONGASEOUS MATERIALS. In: Physiology in the Space Environment. Washington, D. C., National Academy of Sciences - National Research Council, 1968, Chapt. 9, p. 66-78. 72 refs.
CFSTI: N68-20159

Three clearance mechanisms of special interest to respiratory

physiologists are ciliary mucous transport, endocytosis, and lymphatic drainage. The information available on ciliary mucous transport stems mainly from measurements of tracheal cilia in experimental animals; the experimental results vary disconcertingly. A major difficulty in understanding the transport in humans is the absence of basic information on mucous secretion and ciliary activity. Tobacco smoke and many irritants appear to be at least temporary ciliastatics; when chronic or high doses of irritants and other toxic agents are administered, there is frequent damage to the stratified epithelium with loss of ciliary function. As the dominant clearance mechanism in the lung parenchyma for particulate material of molecular, colloidal, and even microscopic dimensions, endocytosis is of primary interest in inhalation toxicology. Many studies support the view that pulmonary macrophages respond to the absolute amount of dust deposited in the pulmonary region. On the other hand, examples exist of dust clearance from the pulmonary region in which the absolute dust burdens varied by more than an order of magnitude without any effect on clearance. There is not evidence that gravitiy plays a role in endocytosis or in the movement of phagocytic cells. Evidence from dust clearance studies suggest that the role of lymphatic drainage in total clearance is minor.

1159 APTIC NUMBER 12241

Myers, D. S.
ESTIMATION OF INHALED PARTICLE SIZE OF 239PUO2 BASED ON THE NEW LUNG MODEL AND BIOASSAY RESULTS. In: Hazards Control Progress Report No. 32(September-December 1968) and Index to Hazards Control Progress Reports Nos. 30 Through 32. California Univ., Livermore, Lawrence Radiation Lab., p. 17-20, 1969.
CFSTI: TID-4500

In a new lung model, particle deposition and elimination are considered functions of aerodynamic diameter and chemical form of the particle and of the breathing rate of the individual. Based on theoretical considerations of the model, it is possible to estimate the aerodynamic particle size of inhaled Pu(239)02. For example, if the theoretical daily elimination of a given quantity of inhaled Pu(239)02 is plotted as a function of time for three different particle sizes (0.5, 2, and 5 micron), the effect of particle size on elimination is apparent. The initial clearance of 5-micron particles of 0.86Q, where Q is the total amount of inhaled Pu(239)02. In comparison, the initial clearance for a 0.5 micron particle is only 0.26Q. The initial clearance is defined as the cumulative fecal elimination through the 2nd day after exposure and includes essentially all the Pu(239)02 cleared from the nasopharynx and tracheobronchial regions. Theoretically, the ratio of initial gastrointestinal tract clearance and the clearance (2 weeks after exposure) appears to be a function of the aerodynamic size of the inhaled particle. The estimation technique has not yet been tested experimentally.

1160 APTIC NUMBER 12286

Nesson, John W. and William R. Shiller
TASTE THRESHOLDS TO BITTER COMPOUNDS DURING A SUBMARINE PATROL. Naval Submarine Medical Center, Groton, Conn., Submarine Medical Research Lab., Proj. MR005.19-6024, Work Unit MR005.19-6024.06, Rept. 538, 5p., June 25, 1968. 11 refs.

The effect of the atmosphere in Polaris submarines on the bitter modality taste threshold is described. Thresholds for quinine were determined during the refit period while in port and used as a baseline. Three subsequent taste tests were accomplished during a 2-month patrol at about two-week intervals. A borderline statistically significant decrease in taste threshold (more sensitive) for quinine was noted with a consistently higher threshold in smokers than in non-smokers, but no explanation can be given for this decrease. It is concluded that, since no great changes in the bitter modality were demonstrated, non-smokers apparently do not react to any tobacco contaminant in the atmosphere by developing an increased taste threshold to bitter. (Author abstract modified)

1161 APTIC NUMBER 11993

Novakova, Eliska
THE EFFECT OF AIR POLLUTED WITH SULPHUR DIOXIDE ON SOME FREE LIVING ANIMALS. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 207-213.

Hares, pheasants, and deer were studied for the effects of sulfur dioxide on weight, bone configuration, red blood cells, or resistance to parasitic disorders of the respiratory tract. Hares living in intensively polluted regions were found to exhibit a statistically significant increase in the number of red corpuscles per cu mm of blood, but a decrease in blood hemoglobin. Deer from areas of long-standing environmental deterioration showed a marked reduction in the articulateness of antlers, stem length, and front projections. In contrast to those from unpolluted areas, pheasants from polluted areas had a higher incidence of attacks of the parasite Syngamus tracheas Mont., due to the increased abundance of sulfur dioxide in worms. No clear-cut evidence was obtained of the effect of exposure to contaminants on animal weight. It is suggested that changes occurring in the bodies of animals inhabiting regions polluted with sulfur dioxide can serve as biological indicators of chronic environmental pollution.

1162 APTIC NUMBER 16917

Parbrook, Geoffrey D.
EFFECTS OF PROLONGED NITROUS OXIDE ON WOUND HEALING. Brit. J. Anaesthesiology, vol. 39:609-612, 1967. 16 refs.

The antimitotic effect of nitrous oxide on surgical wound healing was studied in rats. Two aspects of healing were investigated; wound strength by the use of wound tensiometry and the rate of cicatrization and epithelial growth by assessing the rate of healing of a small area of full thickness skin loss. Female rats were anesthetized and a 4-cm-long incised wound was then made and closed. Three groups of seven rats each, were exposed to 25% nitrous oxide, 21% oxygen, and 54% nitrogen or to 60% nitrous oxide, 21% oxygen, and 19% nitrogen. The duration of exposure to the gases was three days. After exposure the animals were kept for

three days and then killed. No effect on wound strength was detected in rats treated with 25 or 60% nitrous oxide. Similarly, no significant difference was present in the rate of healing of the area of full thickness skin loss after two days of treatment with nitrous oxide. The results suggest that nitrous oxide need not be dangerous to postoperative healing during a limited period of treatment permitted by its marrow toxicity.

1163 APTIC NUMBER 12289

Perelatov, V. D., A. I. Bespalov, A. D. Stepanova, and L. S. Potapenko
EFFECT OF DISCHARGES FROM THE SHAKHTY DISTRICT POWER PLANT ON THE POPULATION'S HEALTH. (Vliyanie vybrosov Shakhtinskoi GRES na zdorov'e naseleniya). Hyg. Sanit., 33(7-9):100-102, July-Sept. 1968.

An air quality survey in the town of Shakhty showed systematic and heavy air pollution within a radius of up to 2 km consisting of dust, sulfur dioxide, and carbon monoxide from a power plant close to the residential areas. Medical examination of schoolchildren living in the power plant area showed a prevalence of catarrhal charges in the nasopharynx 1.9 times higher than in a control group; that of bronchitis, 2.9 times higher; and that of dust in the eyes, 2.5 times higher. A sanitary-protective zone greater than 500 m is considered necessary for a plant of this capacity; at present, there is no zone at all; on one side, the plant stacks are only 150 m from residences. It is recommended that the plant be rebuilt with adequate chimney heights and efficient ash-collection facilities.

1164 APTIC NUMBER 12499

Pratt, Charles D.
ENCLOSED EXHAUST FUMES. Preprint, Society of Automotive Engineers, Inc., New York, 4p., 1967. 18 refs. (Presented at the Society of Automotive Engineers, Texas Section Meeting, Sept. 22, 1967, Paper 680234.)

Air pollution caused by toxic fumes from the internal combustion engine is a concern to public health. Exhaust emissions are divided into four groups: carbon monoxide, nitrogen oxides, hydrocarbons, and aerosols. The acute effects of CO render it of primary concern when dealing with internal combustion engine exhaust. Carbon monoxide can cause anemia, anoxia, amnesia, confusion, poor color discrimination, and possible psychosis. Acute CO conditions exist in industrial plants. Especially dangerous situations can rise from poor ventilation in areas designed for maintaining high or low temperatures. Storage facilities for automobiles, if not properly ventilated, can be very dangerous. Early symptoms of chronic CO poisoning include lassitude, weakness, reduction of general muscle tones, loss of libido, mask-like facial expressions, and a monotone voice. Chronic exposures to CO produce deficiencies in blood forming organs, circulatory system, and the blood. Heart muscle dilations, anemia, low blood pressure, and predispositics to hemorrhages are resultant clinical evidence of chronic CC poisoning. Hydrocarbons, especially polycyclic aromatics, are implicated in cancer formation. Examination of the effects of oxides of nitrogen and aerosols show that they are extremely dangerous. Nitrogen oxides are very toxic to lung tissue. The particulate emissions from the gasoline powered vehicle can cause problems due to their size and chemical properties.

1165 APTIC NUMBER 11801

Ross, Joseph C.
TRACE CONTAMINANTS. In: Physiology in the Space Environment. Washington, D. C., National Acalesy of Sciences - National Research Council, 1968, Chapt. 15, p. 113-121. 8 refs.

Studies of sealed environments have identified numerous trace elements in the atmosphere of confined spaces. The contaminants originate in the degradation and off-gassing of materials within a space, from endogenous production within the body, or from some breakdown of equipment or system. As expected, carbon monoxide is one of the trace contaminants in a closed-system. The rate of carbon monoxide production observed in one closed system study was 0.37 ml/man/hr. The threshold limit value in industry for an eight-hour day is 0.01% (100 ppm) for 480 min. Other studies show that ozone is much more acutely toxic than SO2. Nevertheless, exposures to SO2 are common and can cause both injury and death. With exposures of 150 to 200 ppm, bronchiolitis fibrosa obliterans develops; 50 to 100 ppm induces bronchiolotis with focal pneumonaia. Chronic exposure to 10 to 40 ppm can result in chronic pulmonary fibrosis. Animal studies of other trace contaminants suggest that industrial threshold limit values cannot be used as criteria for long-term exposure. This is true for carbon tetrachloride, phenol, indole, skatole, and hydrogen sulfide. However, the knowledge of man's tolerance to trace contaminants over long periods is not complete, nor is enough known about individual hypersensitivities to inhalation of many trace elements.

1166 APTIC NUMBER 12512

Salvaggio, John, Victor Hasselblad, John Seabury, and L. T. Heiderscheit
NEW ORLEANS ASTHMA. II. RELATIONSHIP OF CLIMATOLOGIC AND SEASONAL FACTORS TO OUTBREAKS. Preprint, Louisiana State Univ., New Orleans, Dept. of Medicine and Public Health Service, Washington, D. C., National Center for Air Pollution Control, 20p., 1969 (7). 20 refs.

The relationship between certain climatological patterns and outbreaks of obstructive pulmonary diseases was investigated. Climatological data, including temperature, barometric pressure, relative humidity, and hourly wind direction and speed, were gather for 5 years. Patient analysis covered 7 years for daily adult and pediatric asthma admissions. High asthma-admission days were associated with minimum temperature and minimum humidity during the months of September, October, and November. Low windspeed and southwest wind direction were related to high asthma-admission days only in October, the month in which most local outbreaks occurred during the 5 years studied. Local outbreaks were generally seasonal, occurring with greater frequency and magnitude during the months of September, October, and November. Individuals involved in outbreaks were not

symptomatic exclusively on epidemic days or during the fall season. Conversely, those not involved in any given outbreak were frequently involved in other epidemics. Pediatric asthma admissions did not parallel adult admissions during outbreaks. It was concluded that since New Orleans asthma affects a homogeneous group of allergic individuals, is associated with climatological variables that adversely affect such individuals, and is generally a seasonal phenomenon, it probably does not differ from conventional extrinsic bronchial asthma.

1167 APTIC NUMBER 11808

Sellent, Robert, Harriet Sun, and Hannes Callisen
DETERMINATION OF CERTAIN SUBTOXIC EFFECTS OF LEAD IN RABBITS AS A FUNCTION OF BLOOD LEAD BURDEN. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 65-72, 1968. 4 refs.

Studies of the toxic effects of different levels of lead in the body require an environment in which laboratory animals can be raised with minimum exposure to lead. For this purpose, special chambers were constructed of lucite and wood. Compressed air is supplied to the chambers through a filtration system calculated to remove approximately 95% of atmospheric lead. Lead samples are obtained for atomic absorption spectrophotometry analysis by adding in turn NaOH, ammonium pyrrolidine dithiocarbamate, and methyl isobutyl ketone to centrifuged mixtures of trichloroacetic acid and whole blood. Preliminary tests indicate that animals kept in the chambers for two months experienced a 25% reduction in lead concentrations.

1168 APTIC NUMBER 11958

Smirnov, D. D.
X-RAY DETECTION OF LEAD-CARRIER STATE AMONG CHILDREN LIVING IN THE VICINITY OF A LEAD-PROCESSING PLANT. Gigiena i Sanit., no. 10:8-11, 1962. 11 refs. Translated from Russian. 6p.

X-ray examination of 511 children from nurseries and kindergartens in the vicinity of a lead processing plant revealed 64 cases of infiltration bands in the zones of preliminary calcification of thigh, shin bone, forearm, and hand bones. Differential diagnosis showed that the infiltration bands are due to lead deposits in the bone tissue. Urinalyses of 31 children revealed that in 7 children, more than 0.04 mg of lead/l urine was found; in 14, the lead concentration varied from 0.01 to 0.028 mg/l; and in 6 children, traces of lead were detected; and in 4 children, no lead was found. In the control group of 12 children, only 1 had lead traces in its urine. Spectrographic analyses of 60 soil samples taken at the site of the nurseries and kindergartens showed that all contained lead in amounts ranging from 0.56 to 0.81% per sample. Cabbages sampled in the vicinity of the plant were ashed along with ten control samples of market cabbage. Photometry of the spectrograms of the ashed cabbage samples revealed that all samples contained lead in quantities ranging from 0.152 to 0.4% of the ash. The control samples contained barely perceptible lead concentrations. The analyses proved that X-ray examination of the skeleton is a suitable method for early detection of excessive lead concentrations in the body.

1169 APTIC NUMBER 12287

Vaughan, William J. and Burton E. Vaughan
LUNG DEPOSITION OF LABELLED MONODISPERSE SUBMICRONIC PARTICLES. Naval Radiological Defense Lab., San Francisco, Calif., Biological and Medical Sciences Div., BUMED Work Unit MF022.03.08-0006, NRDL-TR-68-108, 19p., Oct. 4, 1968. 17 refs.
CFSTI, DDC: AD 679575

In an effort to clarify the factors influencing the variability of previous experimental findings on human lung deposition values, aerosol deposition in the rat lung was determined as a function of particle size between 0.034 and 1.2 micron aerodynamic diameter. Na(22)-labeled aerosol was produced as monodisperse particles by a modified version of the Sinclair-LaMer glycerol generator. Particle size was determined by light scattering and was verified by light and electron microscopy. Anesthetized rats were fitted with a tracheal tube, thus avoiding oral or nasal influences on lung deposition. Respiratory minute volume as determined with this surgical preparation was 97 plus or minus 3 ml/min. This value and the breathing pattern were practically identical to those found in nontracheotomized rats, similarly maintained at a body temperature of 37.5 C. For particles between 0.6 and 1.2 micron, lung deposition varied from 14% to 20%. Fifteen minutes after inhalation, organ distribution of Na(22) outside the lung similar at two different particle sizes and in agreement with other studies based on intraperitoneal injection. Critical comparison of present lung deposition values in the rat with existing data on man showed close agreement with those studies in man giving low lung deposition values (20%) for particles with aerodynamic diameter between 0.6 and 1.2 micron. Particles less than 0.14 micron in size showed lung deposition values of 7 to 8 %; this may be a particular characteristic of the rat. (Author abstract modified)

1170 APTIC NUMBER 16874

Waldbott, G. L. and V. A. Cecilioni
"NEIGHBORHOOD" FLUOROSIS. Fluoride Quart. Repts., 2(4):206-213, Oct. 1969. 9 refs.

In 32 individuals residing near fluoride-emitting fertilizer factories and an iron foundry where fluoride damage to vegetation, livestock and to materials was established, evidence of the non-skeletal phase of fluorosis is presented. The symptomatology is identical with that of the non-skeletal phase of fluorosis recorded by others in industrial fluorosis, in "neighborhood" fluorosis, in hydrofluorosis and in fluoride intoxication from long-term administration of fluoride tablets. Principally involved are musculoskeletal, gastro-intestinal and respiratory systems. Fluoride assays of hay, flydust, food, human tissue and urine are presented. Ten individuals exhibited the skin lesions designated as "Chizzola Maculae" which have been described recently in populations exposed to fluoride emanations near aluminum factories in Italy. (Author's Summary)

1171 APTIC NUMBER 18031

Weissbecker, Ludwig, Robert D. Carpenter, Peter C. Luchsinger, and Thomas S. Osdene
IN VITRO ALVEOLAR MACROPHAGE VIABILITY. EFFECT OF GASES. Arch. Environ. Health, 18(5):756-759, May 1969. 11 refs.

A simple, rapid method was developed for the determination of in vitro alveolar macrophage viability after exposure to gases. Air pollutants such as ozone, sulfur dioxide, and oxides of nitrogen killed alveolar macrophages, as determined by the dye exclusion test. O3 was effective at very low concentrations. Other gases such as CO2, CO, CH4, CH3Cl, acrolein, acetaldehyde, acetone, isoprene, benzene, and HCN had no effect on cell viability. (Author's Abstract)

1172 APTIC NUMBER 18032

Winkelstein, Warren, Jr., and Seymour Kantor
RESPIRATORY SYMPTOMS AND AIR POLLUTION IN AN URBAN POPULATION OF NORTHEASTERN UNITED STATES. Arch. Environ. Health, 18(5): 760-767, May 1969. 11 refs.

A study of the relationship of respiratory symptoms to air pollution from both suspended particulates and oxides of sulfur was undertaken in a random sample of white women in Buffalo during the period 1961 to 1963. Smokers had higher rates of cough with phlegm than did nonsmokers. A positive association between cough with phlegm and suspended particulate air pollution was revealed among nonsmokers 45 years of age and older. An interaction among smokers between residential mobility and respiratory symptomatology was indicated. Among smokers with stable residential histories, cough with phlegm was positively associated with air pollution at place of current residence; while among those smokers who had moved within the previous five years, it was inverse. There was no positive association between respiratory symptoms and oxides of sulfur air pollution. The analysis indicated that the association was not attributable to differences in social class between the air pollution levels. (Author's Abstract)

1178 APTIC NUMBER 16873

Zuskin, Eugenija, Ilsa Zolle, Donald F. Proctor, Solbert Permutt, and Arend Bouhuys
EXPOSURE TO I131-LABELED VISCOSE RAYON FIBERS. MEASUREMENTS OF LUNG CLEARANCE IN RATS. Arch. Environ. Health, 19(5):648-653, Nov. 1969. 16 refs.

Lung clearance has been studied, with external scanning, in 20 living rats after inhalation or intratracheal injection of viscose rayon fibers labeled with radioactive iodine (I131). The clearance rates after both methods of administration appear to occur in two phases. The initial rate of clearance for both modes of administration takes place with a half-life of about two to four hours. The second phase of clearance was much slower after aerosol inhalation than after intratracheal injection. The difference in clearance rates between the two modes of administration became significant 32 hours after exposure. The data suggest that, after aerosol inhalation, a significant amount of particles is deposited in peripheral lung areas, while approximately the same range of size fibers, if injected intratracheally, are deposited within the reach of the mucociliary transport mechanism. (Author's Abstract)

1174 APTIC NUMBER 12517

Adams, Donald F.
AN AIR POLLUTION PHYTOTRON. A CONTROLLED ENVIRONMENT FACILITY FOR STUDIES INTO THE EFFECTS OF AIR POLLUTANTS ON VEGETATION. Preprint, Air Pollution Control Association, New York City, 8p., 1961. 30 refs. (Presented at the Air Pollution Control Association Annual Meeting, 54th, New York, June 11-15, 1961, Paper 61-48.)

A phytotron was designed in which light, temperature, humidity, air circulation, and pollutant concentration can be adequately controlled for studying specific responses of plants to atmospheric pollutants. The phytotron is divided into three walk-in chambers which are designed to introduce the incoming air through the ceiling and exhaust the air through ducts at floor level. A double inlet, three horsepower blower is located within the air duct downstream from an activated charcoal filter. Air cleaning is accomplished with an electrostatic precipitator, a water curtain, and an activated charcoal filter. Decontaminated air flows through two sections for refrigerative heat exchangers for dehumidification and cooling. Very high output lamps for illumination are mounted with 3 and one-half inch spacing between lamps. Ballasts are mounted on an external panel to reduce the heat load in the chambers. The ballast panel is cooled by means of two small fans to prevent overheating. Ottawa flint shot sand provides the mechanical support for the plants and their roots when large numbers of plants are grown in Hoagland's nutrient. Irrigation is automatically controlled with a time clock. In addition to control of the usual variables of the plant environment, the levels of atmospheric fluoride were considered. The fluoride gradient throughout the fumigation is established by exposing lime-treated filter paper in the fumigation chamber. The design concepts and resultant equipment are equally applicable to plant studies using other atmospheric pollutants. Field conditions cannot be produced in a phytotron chamber. However, parameters such as stem elongation and diameter, leaf size and development, chlorophyll, sugar, carbohydrate, enzyme content, and respiration and photosynthetic rates readily respond to all phases of the plant environment and thus introduce difficulties in separating the response to these variables from that of the air pollutant.

1175 APTIC NUMBER 16897

Barrows, Harold L., Joseph H. Caro, Walter H. Armiger, and William N. Edwards
CONTRIBUTION OF AERIAL CONTAMINATION TO THE ACCUMULATION OF DIELDRIN BY MATURE CORN PLANTS. Environ. Sci. Technol., 3(3): 261-263, March 1969. 10 refs.

Greenhouse and field experiments were conducted in which corn was grown on Muskingum silt loam containing added amounts of dieldrin. The plants grown in the greenhouse were protected from aerial contamination, whereas no attempt was made to control this in the field. The corn was harvested at maturity, and the dieldrin contents of the leaves, stalks, kernels, and cobs were determined. Only slight differences were found between the two experiments in the dieldrin contents of the stalks, kernels, and cobs. The leaves of the field-grown plants contained much higher concentrations than those grown in the greenhouse. The leaf-to-stalk ratio of dieldrin concentrations in the field-grown plants was 50 times higher than that found in the protected plants. This large difference is attributed to aerial contamination of the foliage. (Author's Abstract)

1176 APTIC NUMBER 12415

Brandt, C. Stafford
EFFECTS OF AIR POLLUTION ON CROP PRODUCTION. Preprint, 11p., 1967. (Presented at the Ontario Pollution Control Conference, Toronto, Dec. 4-6, 1967.)

The contamination of vegetation by atmospheric sulfur dioxide and fluoride and by phytotoxicants associated with photochemical smogs is discussed. Identifiable plant injuries are summarized and a distinction is made between plant injury and damage. The former is considered to refer to the symptom or the response; the latter, only to the effect of the symptom or response on the desired use of a plant. In the case of sulfur dioxide, acute injury occurs whenever the atmospheric concentration at the leaf exceeds a certain threshold value. As long as the concentration stays less than this threshold, acute injury does not occur. Chronic injury may occur in time. This type of injury is almost impossible to identify with certainty in the field. The easiest description is that of premature senescence, a phenomena that is becoming more and more common in many areas. In the case of fluoride, atmospheric concentrations are of little importance, but the amount accumulated in the tissues is important. When the concentration exceeds certain values, acute symptoms develop. There is no recognizable chronic-type injury due to fluoride. A 10 to 12% reduction of plant productivity along the eastern seaboard is predicted as the result of air pollution in general and photochemical smog in particular.

1177 APTIC NUMBER 16896

Brewer, R. F., F. H. Sutherland, and F. B. Guillemet
EFFECTS OF VARIOUS FLUORIDE SOURCES ON CITRUS GROWTH AND FRUIT PRODUCTION. Environ. Sci. Technol., 3(4):378-381, April 1969. 10 refs.

The effects of fluoride accumulation by citrus trees were studied using several techniques of exposing the trees to soluble fluorine compounds. Weekly sprayings with dilute (0.00125 to 0.0025M) NaF or HF solutions resulted in gradual fluoride accumulation in citrus foliage and produced toxicity symptoms which were indistinguishable from those observed on similar trees exposed to low concentrations of HF gas. Results of intermittent exposure of young citrus trees to HF gas were very similar to those associated with comparable fluoride accumulation from weekly sprayings with NaF or HF solutions. Reduction in top growth of citrus exposed to soluble fluorides was closely correlated with reduced photosynthetic area resulting from smaller leaves and increased leaf fall. Continuous exposure to HF gas resulted in more severe growth retardation than intermittent exposure to higher concentrations or periodic sprayings with soluble fluorides even

though approximately equivalent amounts of F were absorbed in all three treatments. (Author's Abstract)

1178 APTIC NUMBER 17358

De Cormis, L., J. Cantuel, and J. Bonte
CONTRIBUTION TO THE STUDY OF THE ABSORPTION OF SULPHUR BY PLANTS EXPOSED TO AN ATMOSPHERE CONTAINING SULPHUR DIOXIDE.
(Contribution a l'etude de l'absorption du soufre par les plantes soumises a une atmosphere contenant du dioxyde de sourre).
Text in French. Pollut. Atmos. (Paris), no. 44:195-202, Oct.-Dec. 1969. 12 refs.

Tomato plants growing out of a plastic sheet-enclosed earth-compost mixture or sand with a nutrient solution, were exposed to atmospheres with different constant contents of specially prepared sulfur dioxide, some of which was taggered with the radioactive (35)S isotope. The methods of preparation of the atmospheres, of extraction and determination of 'mineral' and 'organic' S absorbed by different parts of the plant, and a measurement of radioactive emissions are described in detail. The tomato plant absorbs SO2 from SO2 - bearing air in proportion to the latter's concentration in air. This absorption process is fast and is accompanied by a release of hydrogen sulfide and a migration of the absorbed S to the various parts of the plant. This migration may ultimately result in an elimination of S by the roots. Whenever the S concentration in the plant had appreciably increased during fumigation, it decreased slowly as soon as fumigation was discontinued. S absorbed in this manner participated normally in the metabolism of the plant, since a large share of S was found in the form of a sulfate as well as of amino acids and S - bearing proteins. Absorption of atmospheric SO2 and the associated H2S emission require the presence of light and, thus are tied to the photosynthetic activity of the plant. Studies of factors contribution to the opening and closing of the stomata, of the role played by the photoreductor elements, and of the activity of the root system as a means of controlling the S concentration in the plant are being planned.

1179 APTIC NUMBER 12331

Feder, W. A., F. L. Fox, W. W. Heck, and F. S. Campbell
VARIETAL RESPONSES OF PETUNIA TO SEVERAL AIR POLLUTANTS. Preprint, National Air Pollution Control Administration, Cincinnati, Ohio, Agricultural Section, Agricultural Research Service, Cincinnati, Ohio, Crops Research Div., and Massachusetts Univ., Waltham, 11p., 1968. 2 refs.

Fifteen varieties of petunia plants were tested for their sensitivity to urban pollutants. The plants were exposed in standard greenhouse exposure chambers to three concentrations of ozone, sulfur dioxide, peroxyacetyl nitrate (PAN), and nitrogen dioxide for one hour and to a single concentration of irradiated auto exhaust for 1.5 hours. Only six varieties were exposed to PAN. All results are tabulated, with plant injury recorded as a percentage injury to the whole plant. Comparative sensitivity of the 15 varieties to each pollutant is indicated. Among the most sensitive plants were both red and white flowering varieties. The highest comparative sensitivities were shown by the varieties White Cascade, Red Magic, and Warrior.

1180 APTIC NUMBER 12149

Heagle, Allen S.
EFFECT OF LOW-LEVEL OZONE FUMIGATIONS ON CROWN RUST OF OATS.
Preprint, Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration, 10p., 1969 (7). 9 refs.

Exposure to 10 pphm ozone for 6 hr in the light 10 days after infection significantly reduced the growth of Puccinia coronata uredia on the crown rust differential varieties of Avena sativa. Urediospores produced on the plants that were exposed to ozone germinated as well, produced as many appressoria, and penetrated stomates as well as spores produced on unexposed leaves. Exposure on dry leaves to 20 pphm ozone for 3 hr for 1-5 days did not affect urediospore germination, appressoria formation, and penetration. The suppression of the uredium development of the crown dust fungus in this experiment was caused by ozone levels commonly surpassed in many areas, suggesting that the growth of this and possibly other plant parasites is affected by photochemical air pollution. (Author abstract modified)

1181 APTIC NUMBER 17210

Kotaka, Sadao and Albert P. Krueger
STUDIES ON THE AIR-ION-INDUCED GROWTH INCREASE IN HIGHER PLANTS. In: Advancing Frontiers of Plant Sciences. Lokesh Chandra (ed.), vol. 20, New Delhi (India), Impex India, 1968, p. 115-208. 57 refs.

Preliminary studies were conducted on the effect of gaseous ions on higher plant growth. The influence of ionized oxygen and carbon dioxide on the growth of barley and the influence of reduced-ion-air on the growth of Hordeum vulgaris was determined. Exposures of oat, barley, lettuce, pea, and maize seedlings to unipolar ionized atmospheres of either negative or positive charge produced statistically significant growth stimulation. The extent of growth increase was related to atmospheric ion density. Analytical data showed that no significant alterations in composition developed in the ion-treated oat or barley. Moderate densities of O2(-) and O2(+) (18,000 ions/ml) in air containing an added 8% O2 accelerated the growth rate under laboratory conditions. Approximately the same number of CO2(-) and CO2(+) ions in air containing 8% CO2 inhibited growth, impeded the production of chlorophyll, and devitalized young seedlings. Studies were also conducted on the biochemical mechanisms of air-ion-induced growth increase in higher plants. Experiments included air ion effects on free and bound IAA, studies on air-ion-enhanced preparation of iron-chlorotic seedlings, and air ion effects on iron incorporation into early germinating seeds. Equilibrium between free and bound IAA in barley was not displaced by exposure to air ions. Hordeum vulgaris seedlings grown in a chemically defined iron-free nutrient solution developed iron chlorosis. When the growth took place in unipolar ionized atmospheres of either charge, the onset of chlorosis was accelerated and accompanied by the appearance of large amounts of cytochrome c. When the seedlings were grown in a substrate

containing iron and were exposed to ionized air, they did not develop chlorosis but exhibited the typical ion-induced increase in growth rate and an increased production of cytochrome c. Air ions enhanced incorporation of iron into early germinating barley seeds. The synthetic mechanism of the iron-containing enzymes and heme in air-ion-treated plants is being investigated.

1182 APTIC NUMBER 11990

Kozel, Jaroslav and Vladimir Maly
THE EFFECT OF INDUSTRIAL EFFLUENTS ON THE FERTILITY OF SOILS AND YIELDS OF AGRICULTURAL PRODUCE. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Litlice House of Scientific Workers, 1965, p. 184-193.

Rapid development of industrial establishments and thermal power stations in Czechoslovakia has produced excessive air pollution in some regions. This fact is unfavorably reflected in relation to soil fertility and plant yield, as determined by studies conducted at experimental farms located near emission sources. High decreases in yield are shown by winter wheat, oats, barley, flax, potatoes, and forage. In addition, plant quality has been affected, particularly in the case of sugar beets, silage corn, and forage. The content of sulfur trioxide in the ash of plant contaminants and the amount of ash in plant organic matter are in most cases higher than values reported in the literature for normal conditons. In one area, dust fall ranges from 3000-7000 t/sq km/yr and its sulfur dioxide content is higher than allowable average values. Soil samples show increasing sulfur dioxide concentrations, increasing acidity, and the presence of numerous elements presumed to have toxic effects. The recommendation is made that industry install efficient separators and maintain them in proper working condition.

1183 APTIC NUMBER 12332

Larsh, Robert N., P. Robert Miller, and Steven L. Wert
AERIAL PHOTOGTAPHY TO DETECT AND EVALUATE AIR-POLLUTION-DAMAGED PONDEROSA PINE. Preprint, Air Pollution Control Association, New York City, 15p., 1969. 7 refs. (Presented at the Air Pollution Control Association Annual Meeting, 62nd, New York, June 22-26, 1969.)

Forest stands in the San Gabriel and San Bernardino Mountains of southern California have been severely damaged by oxidants from Los Angeles smog. On an estimated 25,000 acres of damaged forest land, ponderosa pine (Pinus ponderosa L.) is the most affected tree species. After initial surveys designed to ascertain the cause and precise symptoms of observed chlorotic decline, a method was needed to detect and evaluate damage rapidly and accurately in the field. Ground survey techniques could not be employed exclusively because of the rugged terrain and expense involved in a thorough investigation. Therefore, a feasibility study comparing various aerial films, filters, and photographic scales was conducted over four plots to develop an accurate and less costly survey method. Anscochrome D-200 color film at scales of 1:7920 and 1:1584 was optimum for damage detection and evaluation. (Author abstract modified)

1184 APTIC NUMBER 12498

Laseter, J. L. and D. J. Weber
BIOSYNTHESIS OF LONG-CHAIN NON-ISOPRENOID HYDROCARBONS IN BRASSICA OLERACEA. Preprint, Houston Univ., Tex., Dept. of Biology and Louisiana State Univ., New Orleans, Dept. of Biolgocial Sciences, 32p., 1968 (?). 45 refs.

The theories for biosynthetic routes of long-chain non-isoprenoid hydrocarbons were tested in cabbage. The major components of the liquid fraction of the leaves of young cabbage as determined by gas chromatography and other methods were alkanes, ketones, esters, and free fatty acids. The saturated hydrocarbons range from about C 20 through C 31 with the majority as C 29 (90%). The benzene eluate contained one major component identified as 15-nonacosanone. Palmitic acid was the major saturated fatty acid (12%). The major unsaturated fatty acids were linoleic (18%) and linolenic acid (22%). Acetate was incorporated equally well into both alkanes and ketones irrespective of whether the label was in the first or second carbon. Strong alpha oxidation inhibitors did not reduce the amount of incorporation of acetate into the wax products. Fatty acids were good precursors for the synthesis of various wax components. Carbon 18 was better than C 16; C 16 was better than C 14. Crude cell-free systems were capable of low levels of wax synthesis in cabbage leaf extracts from stearic acid substrates. Soluble protein fractions of cabbage were capable of synthesizing esters from a stearic acid substrate. A workable hypothesis was proposed, based on the present level of knowledge which supports the concept that palmitic acid, the only saturated acid present in a reasonable concentration in cabbage leaf cells, is the major natural precursor for the long-chain wax components by a process of elongation by C 2 units to a C 30 acid, which is then decarboxylated and reduced to yield nonacosanone. The long-chain fatty acids are not direct precursor-product entities, but are produced as by-products from an elongation mechanism that will eventually yield long-chain paraffins and other wax components. Stearic acid, therefore is capable of entering this wax synthetase system one acetate unit ahead of palmitic acid and serves as a better precursor. (Author summary modified)

1185 APTIC NUMBER 12155

Leone, Ida A., Eileen Brennan, and R. H. Daines
EFFECTS OF AIR POLLUTION ON VEGETATION. Preprint, Air Pollution Control Association, New York City, 6p., 1962. (Presented at the Air Polltuion Control Association, Mid-Atlantic States Section Meeting, Wilmington, Del., Oct. 26, 1962.)

Phytotoxic pollutants are broadly catergorized as primary or single source emissions and the products of photochemical reactions arising from urban expansion and vehicular traffic. Among the primary contaminants, classified according to their demonstrated order of toxicity to plants, are hydrogen fluoride, chlorine, sulfur dioxide, ammonia, and hydrogen sulfide; to these may be added ethylene and perhaps natural illuminating gas. The acute and chronic types of injury caused by SO2, the earliest known offender, and by hydrogen fluoride are described.

The latter is the most insidious of the phytotoxic pollutants, since it is injurious to certain sensitive species at fractions of a part per billion. The two most significant pollutants from photochemical reactions are ozone, which generally attacks the upper leaf surface of sensitive plants, and oxidized hydrocarbons. The chief offender of the oxidized hydrocarbons is peroxyacyl nitrate and its analogues. Plant injury from specific pollutants can be diagnosed by particularly susceptible species or indicators, by type of symptom, and by significant emission sources in the vicinity. Air quality and meteorological data from three New Jersey communities - Carlstadt, New Brunswick, and Bordentown - are briefly reviewed in relation to phytotoxic episodes. Possibe control measures in combatting pollution damage to plants include anti-oxidant sprays and the breeding of resistant plant varieties.

1186 APTIC NUMBER 11992

Masek, J. and K. Hais
THE INFLUENCE OF INDUSTRIAL EXHALATIONS. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 201-206.

Cattle were studied for the effects of industrial emissions in three heavily polluted areas of Czechoslovakia and compared with cattle from a control locality where the atmosphere was relatively clean. Deposited dust particles in the areas under investigation ranged from 506 to 2585 t/sq km per year. Slaughtered cattle from the polluted areas exhibited macroscopically perceptible 'dusting' of lungs and lymphatic nodes. In an area of heavy arsenic contamination, two and three abortions were reported for groups of 30 and 36 gravid cows. The amount of arsenic found in milk exceeded proposed admissible limits. Young cattle in areas of smoke pollution showed a statistically significant inbalance of eucoloditis among protein fractions of blood serum, significant increased transaminase activity of glutamic-pyruvic acid, and increased cholinesterase activity in erythrocytes. Examinations of blood smears revealed more pronounced hypersegmentation in cattle from experimental localities. Milk production in the experimental cattle decreased by 9.1 to 12.5% per day. Temporary measures proposed to reduce the harmful effects of dust on cattle include provisions for green belts in industrial areas, the use of fodder from noncontaminated areas, and the mechanical dedusting of hay.

1187 APTIC NUMBER 16900

Mohamed, Aly H.
CYTOGENETIC EFFECTS OF HYDROGEN FLUORIDE ON PLANTS. Fluoride Quart. Repts., 2(2):76-84, April 1969. 8 refs.

Studies on the effects of HF on meiotic chromosomes of tomatoes indicated a trend toward a higher frequency of chromosomal aberrations with an increase in the fumigation period. It was indicated that HF was capable of inducing paracentric inversions with the possibility of the induction of deficiencies, duplications, or even translocations. The progeny obtained from the treated plants produced a number of abnormal phenotypes, the same as, or similar to, known mutations. Further studies in maize microsporocytes for plants treated with HF confirmed the cytological results obtained in tomatoes with clear evidence of the occurrence of inversions, translocations and deficiencies. These results suggest that HF seems to affect primarily the DNA molecule by blocking its replication, probably through its action on the enzymatic systems. (Author's Summary)

1188 APTIC NUMBER 12195

Mukammal, E. I., C. S. Brandt, H. Neuwirth, D. H. Pack, and W. C. Swinbank
AIR POLLUTANTS, METEOROLOGY, AND PLANT INJURY. World Meteorological Organization, Geneva, Switzerland, Commission for Agricultural Meteorology, WMO-TN 96, WMO-No. 234.TP.127, 73p., 1968. 177 refs.

The problem of air pollution injury to agriculture and the present state of knowledge is reviewed in order to assist meteorologists and others concerned in seeking means of preventing or controlling the extent of injury. The source of various contaminants and their chemical reactions in a contaminated atmosphere are examined in detail. The variations in the susceptibility of plants to air pollution damage as related to meteorological and other factors in the plant environment are described. These factors, many of which exert their influence through their effect of stomatal movement, include light, nutrition, exposure, relative humidity, and temperature. The recognizable symptoms of air pollution injury are discussed and suggested for indentifying the causative agent and recognizing similar symptoms produced by other disorders are given. A section on air pollution meteorology states that knowledge of the atmosphere's ability to transport and dilute contaminants cannot be applied to air pollution problems without concurrent consideration of pollutant emissions and the biological sensitivity and response characteristics of certain plants. The effects of surface configuration on diffusion, to vertical and horizontal turbulent diffusion, atmospheric transport, research problems, and meteorological applications to air pollution problems are discussed. Present and possible future progress in the prediction of pollutant concentration, air pollution potential, and pollution damage are reviewed; the general principles involved in collecting and analyzing air samples to determine the nature and concentrations of pollutants are outlined. Control measures and the present situation are also discussed. (Author summary modified)

1189 APTIC NUMBER 11989

Pfeffer, A.
THE EFFECT OF AIR POLLUTED WITH SULPHUR DIOXIDE ON THE COUNTRYSIDE. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 171-183. 24 refs.

The behavior of sulfur dioxide in the countryside and the effect

of terrain on its dispersion are reviewed, together with the harmful effects of sulfur dioxide on vegetation, soil, and animals. In the countryside, sulfur dioxide acts slowly and inconspicuously, thus escaping detection for considerable periods of time. The intensity of the damage depends on the potency of the emission source, shape of the terrain, force and direction of prevailing winds, kind and extent of precipitation, the tolerance of individual species and organisms, and possibly on the presence of other noxious agents. The SO2 concentration is always heavier in hilly country and in the mountains than in level country, and damage is on a larger scale, corresponding to the size of the source. Plants growing on slopes or at an elevation corresponding to 2 to 5 times the chimney height are most strongly affected. In Czechoslovakia, sulfur dioxide contamination has reduced the yield of cereals, potatoes, grass hay, silage corn, and flax. Poor sandy soils are most affected by sulfur dioxide; soils on limestones and basalts are the least affected. The direct effect on the animal organism is less intensive than that exercised in plants, but the indirect effect conditioned by changes in plants can be significant in afflicted regions. The effects are discussed in terms of those exerted on ground fauna, fauna of polluted streams, insects and mites, and vertebrates.

1190 APTIC NUMBER 16894

Poovaiah, B. W. and H. H. Wiebe
TYLOSIS FORMATION IN RESPONSE TO FLUORIDE FUMIGATION OF LEAVES. Phytopathology, 59(4):518-519, April 1969. 6 refs.

Atmospheric fluoride typically causes injury and necrosis at the tips and edges of leaves. In earlier anatomical studies, microscopically detectable changes were reported only for macroscopic injury. In this report, the occurrence of tyloses in the xylem at some distance from the principal site of fluoride injury is discussed.

1191 APTIC NUMBER 11991

Spaleny, J., M. Kutacek, and K. Oplistilova
ON THE METABOLISM OF S(35)O2 IN THE LEAVES OF CAULIFLOWER (BRASSICA OLERACEA VAR. BOTRYTIS L.). In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 194-200. 13 refs.

A study was made of the incorporation of S(35) from gaseous S(35)O2 absorbed by cauliflower leaves into thioglucoside glukobrassicin. The radioactivity of the fission product of thiocyanate was proved by splitting radioactive glukobrassicin formed in the leaves by endogenic myrosinase. The incorporation process involves biosynthesis rather than a mere exchange of radioactivity in the ion (H-OSO3). Analogically, it may be assumed that atmospheric sulfur dioxide is one of the sources of formation of thioglucosides in general. Some of the fission products of the latter substances are strong thyreostatics and strumigens. Thus a new relationship comes into play in the problem of smoke exhalations. Thioglucosides and their products are biologically active substances of interest also from the viewpoint of plant physiology. Some of them are known for their bactericidal, fungicidal, or herbicidal effects. Their significance as regards the mechanism of the toxic action of SO2 on plants cannot be underestimated. (Author summary modified)

1192 APTIC NUMBER 11663

Steinhubel, Gerja
CHANGES IN THE STARCH RESERVES OF HOLLY LEAVES AFTER ARTIFICIAL CONTAMINATION WITH SOLID DUST. (Zmeny v skrobovych rezervach listov cezminy po umelom znecistani pevnym popraskom). Biologia, 18(1):23-32, 1963. 26 refs. Translated from Slovak. 14p.

Dust from a metallurgical plant was applied to shaded and unshaded leaves of evergreen holly trees (Ilex aquifolius L.) to determine the effect of contamination on the level and distribution of starch content. The contaminants increased the production of starch in periods of sunlight but decreased production in periods of diffuse illumination, especially periods of prolonged cloudy weather. Because the holly is a shade-loving plant, the effects observed are thought to be due to the absorption of light rays by the applied layer of contaminants. On the basis of the investigation, the most advantageous time for taking sample shoots for determining the loss of starch reserves is about 0400 and 0800 in the morning from a sunlit stand, with simultaneous control in diffused light. (Author conclusions modified)

1193 APTIC NUMBER 16633

Steinhubel
CONTRIBUTION TO THE STUDY OF THE EFFECTS OF NONTOXIC EMISSIONS ON WOODY PLANTS. (Prispevok k studiu ucinkov netoxickych emisii na driviny). Scientific and Technical Society, Prague (Czechoslovakia), Agriculture and Forestry Section, Proc. Conf. Effect Ind. Emissions Forestry, Janske Lazne, Czechoslovakia, 1966, p. XIX-1 to XIX-36. (Oct. 11-14.) Translated from Czech. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, April 24, 1969.

The possibility of whether the decrease in the formation of dry matter could also be caused by deterioration of the balance between 'formation of dry matter and destruction' is reported. A known photosynthesis has its optimum at temperatures lower than those of dissimilation and thus, at super-optimum temperatures, a decrease in the efficiency of photosynthesis can arise. The gross dry matter formation for three various temperatures was determined. Dry matter formation in darkness was checked and the intensity of dissimilation was tested by a manometric method. The gross dry matter growth increment in pure leaves rose with increasing temperatures much more rapidly than that in contaminated leaves, which exhibited decreased dry matter formation. The curve of the relative increase of respiration at equal temperatures indicates that the difference should be ascribed to dissimilation. Investigation of the water supply showed that improvement of situation in dusted leaves (increased release of water, reduced water content) can be expected only under intensive irradiation in laboratory conditions. (Author abstract modified)

1194 APTIC NUMBER 18041

Taylor, O. C.
IMPORTANCE OF PEROXYACETYL NITRATE (PAN) AS A PHYTOTOXIC AIR POLLUTANT. J. Air Pollution Control Assoc., 19(5):347-351, May 1969. 25 refs.

Peroxyacyl nitrates are a family of compounds which result from photochemical reactions between contaminants released to the atmosphere by combustion of organic fuels. Peroxyacetyl nitrate (PAN) is the most abundant member of this family and is responsible for serious injury in some polluted areas. Plant injury has been recognized in at least 19 states and several foreign countries but economic loss has caused greatest concern in California. Characteristically, injury from PAN appears as glazing or bronzing of the lower leaf surface but the symptom syndrome may also include tissue collapse, chlorosis, and leaf drop. PAN inhibits activity of several enzyme systems by attacking the sulfhydryl group when enzyme extracts are fumigated in vitro. PAN may produce visible symptoms when sensitive plants are exposed for 4 hours to about 14 ppb. Other chemical members of the family are more toxic than PAN. Concentrations of 20 to 30 ppb PAN occur frequently at Riverside, California, and a maximum peak of 58 ppb was measured for one 2-hour period. Peaks as high as 54 ppb were reported at Salt Lake City, and 210 ppb at Los Angeles, California. (Author's Abstract)

1195 APTIC NUMBER 17355

Vogl, Michael
EFFECTS OF SEASON AND SOME OTHER FACTORS ON NET ASSIMILATION AND FUME RESISTANCE, STUDIED WITH TWO PROVENANCES OF PINUS SILVESTRIS L. (Orientierende Untersuchungen zur Nettoassimilation und Rauchhaerte zweier provenienzen von Pinus silvestris L. in Abhaengigkeit von der Jahreszeit und anderen Faktoren). Text in German. Arch. Forstw., 18(12):1317-1323, 1969. 29 refs.

The effects of season, light, and temperature on the net assimilation of Pine needles stemming from species native to Tolonovaara, Finland the needles of which turn yellow in winter and to La Matte des Angles, Pyrenees, the needles of which stay green in winter were studied. For this purpose, plants of the above species were grown in semi-shade under the same conditions. The assimilation was measured according to the method by Polster and Weise. No description of the method is given. For the fume resistance tests, the same plants were used but they were two years older. The light curves of assimilation were remarkable influenced by season and temperature. Pinus that turn yellow in winter are nevertheless capable of considerable net assimilation even during the state of yellowing. Of the two provenances, the one whose needles stay green in winter was much more sensitive to sulfur dioxide fume than the one whose needles turn yellow.

1196 APTIC NUMBER 17369

Lilet, L. and J. Hissel
METHODS AND RESULTS OF STUDIES OF THE ATMOSPHERIC CORROSION OF CONSTRUCTION STEELS. (Methodes et resultats d'etudes de la corrosion Atmospherique des aciers de construction). Text in French. Tribune Cebedeau (Centre Belge Etude Doc. Eaux), 22(312): 538-547, Nov. 1969. (22nd Journees Internationales D' Etude Des Eaux, Liege, Belgium, May 1969.)

A total of 2000 50 mm wide by 100 mm high samples of 30 different Benelux and U. S. construction steels, pickled to insure a clean surface, were fastened to a total of 40 prefabricated racks and exposed since 1962 at three typical locations: at Liege (industrial-urban); at Ostend, in front of the sea wall (sea); and at Ostend, 250 m inland from the sea wall close to a naval yard (sea-industrial). No rural location was used, as it was previously found that it parallels the industrial at lower mean levels. The loss of weight of the samples was measured after 6, 12, 18, 24, 36, 48, 72, and 120 months. In all cases, the loss of weight increased, at a slightly decreasing rate, with the length of the exposure. The lowest and highest loss of weight and decrease of sample thickness in mm after an exposure for 6 years at the locations are compiled. In the 6-year exposure the atmosphere at the 2nd location was 2 times as great as that at the third location. The 3rd location showed results 1.4 times weaker than that at the 2nd location and 1.5 stronger than that at the 1st location. By a variety of methods of data evaluation the adverse effect of a sulfur content and the favorable effects of Cu, P, Cr, Ni and Si contents on the corrosion resistance of structural steels were demonstrated, as well as the marked effect in Mn in a sea atmosphere. A method of production of air with a specified SO2 content as well as methods of determining the corrosion products: FeSO4, Fe2(SO4)3, H2SO4 and H2O are described.

1197 APTIC NUMBER 16519

Matsushima, Iwao, Tadayuki Ueno, Akihiro Tanada, and Hiroyuki Kubota
WEATHERING STEEL - ITS PROCESS TO FORM PROTECTIVE RUST FILMS. (Taikoseikosabiso no anteika niitaru keika). Text in Japanese. Nippon Kokan Giho (Tokyo), no. 46:97-109, 1969. 11 refs.

Low-alloy, weathering steels show improved corrosion resistance to the atmosphere by the spontaneous formation of protective rust films. The process through which rust becomes protective was described based on field tests and the results of laboratory examinations. Included are the change of external appearance in color, the essential nature of protective films, the effects of climatic conditions, and geometrical influences of the steel structure. The most drastic change of rust color takes place during the first year of exposure; starting from orange, turning to red brown, and then to dark brown. The dark brown color indicates the approximate achievement of protectiveness. The change thereafter is relatively slow, gradually increasing in darkness, and in several years, the rust becomes fully protective. The protectiveness of the rust film depends largely upon the number and distribution of anodic sites or defects in the film, which gradually decrease with continued exposure to the atmosphere. In more polluted atmospheres, the protective film is formed sooner, but not as well. Consequently, the corrosion rate is higher than in rural atmosphere, but the corrosion resistance relative to that of ordinary steel is greater. The geometry of the exposure has a significant influence on the process of protective rust formation. When a weathering steel is exposed under unfavorable conditions where the surface is not allowed to become wet and dry repeatedly with proper intervals, its formation may be considerably retarded. Thus, a clever designing of the weathering steel structure based on a good knowledge of its corrosion characteristics will help keep the structure both corrosion resistant and beautiful. (Author summary modified)

1198 APTIC NUMBER 12318

Anderson, Robert J. and Thomas D. Crocker
THE SITE VALUE APPROACH TO THE MEASUREMENT OF ECONOMIC LOSSES DUE TO AIR POLLUTION. Preprint, Air Pollution Control Association, New York City, 12p., 1969. 3 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, June 22-26, 1969.)

An investigation of the hypothesis that air pollution and site values are negatively related is described. According to this hypothesis, sites with relatively tolerable effects of pollution should rise in value relative to sites with less tolerable effects. Using data from the St. Louis, Kansas City, and Washington, D. C. metropolitan areas, a regression model was developed in which property, neighborhood, and occupant attributes served as explanatory variables and property values and rents as the explained variables. Results confirmed a negative relation between property values and pollution, significant at the .05 level. The analysis indicated that in each city, $12,000 properties in relatively high concentrations of sulfur oxides and particulates are valued at anywhere from $300 to $500 less than their counterparts in relatively pollution-free areas. A similar study of two counties in Florida is also described, in which results showed that the property value approach to the measurement of air pollution damages appears to be as applicable to agricultural as to urban areas. Thus, although many important effects are not captured in land value differentials and many ambiguities remain to be clarified or eliminated, the site value approach, for general ease of measurement and inclusiveness, is considered to be one of the more promising in estimating economic losses due to air pollution.

1199 APTIC NUMBER 11995

Bretschneider, Boris
ECONOMIC CONSEQUENCES OF ATMOSPHERIC POLLUTION DUE TO EXHALATION FROM LARGE THERMAL POWER PLANTS IN CZECHOSLOVAKIA. In: Preprints of the Czechoslovak Reports. International Symposium on the Control and Utilization of Sulphur Dioxide and Fly-Ash from the Flue Gases of Large Thermal Power Plants. Liblice House of Scientific Workers, 1965, p. 226-236.

The economic consequences of pollution caused by thermal power plant emissions can be reliably expressed in numbers; this is especially true for agricultural and forest production. The contribution of emissions to increased living costs, represented for example by higher water consumption and the cost of cleaning or replacing clothing, is more difficult to express in numbers. Determination of the damage to the health of a population is extremely difficult in the absence of sufficiently convincing proof or a method of economic evaluation. However, the growth of the indices of drug expenditures in industrial regions between 1960-1963 suggests that serious attention should be given to this problem. Although it is impossible to calculate or express all the negative consequences of pollution by power plants in precise economic terms, estimations imply that they are enormous. Technology must be applied to limiting the emissions to bearable values.

1200 APTIC NUMBER 11791

A STUDY OF PROCESS COSTS AND ECONOMICS OF PYRITE-COAL UTILIZATION. Little (Arthur D.) Inc., Cambridge, Mass. and Dorr-Oliver, Inc., Stamford, Conn., Contract PH 86-27-258, 251p., March 1968.
CFSTI: PB 182303

The economics of utilizing iron pyrite (FeS_2) from coal beneficiation were investigated; the prices that might be paid coal operators for low-sulfur coal and an acceptable grade of pyrite feed material for use in sulfuric acid manufacture were determined. The net financial benefits to operators are estimated at $1.16 to $1.57 per ton of coal processed. A premium of $1.10-$1.20 per ton of coal should be paid by nonutility users and by utilities subject to stringent air pollution abatement restrictions. Of this amount, approximately $0.30 represents the net value of the coal to a user; the balance represents the premium connected with achieving lower sulfur content in the stack gas and reduced sulfur dioxide pollution of the atmosphere. It is emphasized that considerable tonnages of pyrite-bearing coal must be processed to support a 1500-ton-per-day sulfuric acid plant. Assuming a feed stream containing 85% pyrite, a requirement of 1550 pounds of feed per ton of 98% acid produced, an original sulfur content of 4%, and a coal yield of 90%, 5.1 million tons/yr of coal will have to be beneficiated to yield 1% sulfur-content coal. Investment and operating costs have been calculated for every combination of the three major variables associated with sulfuric acid production: plant capacity, feed composition, and plant type. The results show manufacturing costs to be $5.51 to $25.40 per ton of acid and plant investment, $3.7 to $35.5 million.

1201 APTIC NUMBER 12354

Ernst and Ernst, Washington, D. C.
A COST-EFFECTIVENESS STUDY OF AIR POLLUTION ABATEMENT IN THE NATIONAL CAPITAL AREA. Contract PH 86-68-37, 68p., Jan. 1969. 23 refs.

The methods and results of a study to develop estimates of the cost of achieving selected air quality levels in the National Capitol Area under different air pollution abatement strategies were presented. The study was confined to stationary sources of sulfur oxides (SOx) and suspended particulates (SP). A computer-assisted model was developed which simulated the average annual concentration of the two pollutants. Other programs then computed the estimated annual cost of simultaneously reducing ground-level concentrations of SOx and SP to stated levels at a number of designated receptor points under each of the 3 strategies for Area-wide abatement. These estimates annual costs were determined for each of the 99 major sources in the Area and for 13 aggregates of small sources. The following 3 strategies for Area-wide abatement were simulated; the least cost combination of emission controls for all sources which achieves selected air quality levels for SOx and SP at the least total cost to the whole area; restricting fossil fuels to 1% sulfur content by weight or less;

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and requiring all souces simultaneously to take successively greater steps in reducing emissions until maximum control is reached. The estimated additional annual costs for achieving postulated air quality levels by the 3 strategies were shown. The principal costs distributed among major classes of emission sources were also given. The figures showed where the costs would be incurred. The cost for maximum control in the National Capital Area is $42.65 million. (Author summary modified)

1202 APTIC NUMBER 11815

Garet, Ronald, Richard Drapkin, and Andrew Schaeffer
THE ECONOMIC EFFECT OF OZONE ON HOME MAINTENANCE COSTS IN THE LOS ANGELES BASIN. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 223-254, 1968. 14 refs.

The effect of ozone on home and car maintenance costs in the Los Angeles Basin was researched by mailing 10,000 surveys to residents of Glendale in Southern California and Mountain View in Northern California. The goal was to determine the percentage frequencies with which residents of a city with little ozone repaired and replaced common household items, fan belts, and automobile tires as compared to those frequencies in a community with high ozone concentration. Preliminary analysis of 2400 returns show definite differences between Glendale and Mountain View, due probably in part or whole to ozone. The differences range from a few to several hundred percent. They indicate that the cost of air pollution to individuals in the Los Angeles Basin greatly exceeds the sixty dollars per year estimate of the California State Air Resources Board.

1203 APTIC NUMBER 16858

Jackson, W. E., H. C. Wohlers, and W. DeCoursey
DETERMINING THE COSTS OF AIR POLLUTION CONTROL. J. Air Pollution Control Assoc., 19(12):917-923, Dec. 1969. 16 refs.

A general procedure has been described that can be followed for estimating the cost of reducing air pollution emissions within a metropolitan region. The six step procedure examines emission inventories, regional trends, control trends, alternate control schemes, control costs, and optimum cost-effectiveness. The procedure is illustrated for one emission source in the Delaware Valley. By application of "feasible controls," automobile emissions were shown to be reduced from 4.5 billion pounds per year in the Region during 1968 to 1.5 billion pounds in the year 2000. Annual control costs during the same period will increase from $30 million to over $300 million per year. This represents a cost increase from $15 per registered vehicle in 1968 to about $58 per vehicle per year in 2000. A method was illustrated for determining minimum cost to achieve any desired degree of emission reduction where alternate feasible control schemes are available. This method is especially useful where the allocation of scarce resources is involved. The general procedure is applicable to any number of pollutants and emission sources, and may be useful for calculations in any metropolitan area. The objectives of the present study are to apply this method to other sources within the Delaware Valley and to determine total regional costs for various levels of emission reduction. As one example of a practical application for this type of analysis, the economic impact of regulatory schemes can be evaluated on a cost-effectiveness basis. (Author's Abstract)

1204 APTIC NUMBER 12129

McCaldin, Roy O.
ECONOMICS OF AIR POLLUTION. Preprint, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, 7p., 1962. 11 refs. (Presented at the Conference on Air Pollution Control, 7th Annual Metropolitan, Cincinnati, Ohio, Oct. 23, 1962.)

Problems associated with economic determinations of air pollution damage are considered and illustrated by various studies. Even when damage is clearly evident, it is difficult to separate the specific contribution of man-made air pollution from other environmental factors. Moreover, it may be extremely difficult and expensive to determine the specific relationship between a single emission source and a specific effect when the source and receptor are within a complex urban area. For these reasons, up-to-date information on the costs of air pollution is unavailable. However, estimates are available of total pollution costs derived from studies of such limited aspects as the lifetime of paint or zinc. In some cases, the estimates have merely updated previous figures by adjusting for population growth and dollar value. In other cases, new effects and cost data have been considered. The various estimates for the U. S. range from 2-12 billion dollars a year or 10-60 dollars per person per year. The health aspects of pollution are rarely included in these estimates. To develop optimum ratios between the cost of pollution and the cost of prevention, sound estimates of damage under existing conditions must be developed, together with estimates of the reduction of damage that would prevail with various degrees of pollution control.

1205 APTIC NUMBER 11677

Wilson, Richard D. and David W. Minnotte
A COST-BENEFIT APPROACH TO AIR POLLUTION CONTROL. Preprint, Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, 29p., June 1968. 4 refs.

Previous analyses of the economic aspects of air pollution have stressed either the cost of control or the damages caused by pollution. No analysis has combined both aspects into a meaningful analysis of the overall economic impact. A cost-benefit technique is presented that balances the cost of controlling pollution with the benefits received from its control to find the level of pollution abatement for a community. This is done by summing profits equations from the control of each emitter. The method is restricted to suspended particulates, annual average pollution levels, stationary sources, and residential soiling damages. The technique is illustrated by application to the Washington, D. C. area. A regulatory fee system which would achieve the standards provided by the cost-benefit analysis is also presented.

1206 APTIC NUMBER 18040

Wilson, Richard D. and David W. Minnotte
A COST-BENEFIT APPROACH TO AIR POLLUTION CONTROL. J. Air Pollution Control Assoc., 19(5):303-308, May 1969. 6 refs.

Air Pollution has plagued the urban areas of our Nation for many years, both as a serious health hazard and as a costly economic burden. Users of the air as as a waste disposal medium have treated it as a free resource with no regard for the damages incurred by receptors of the dirty air. Unfortunately, no self-regulating market forces exist that will bring this diseconomy into an acceptable equilibrium. An outside regulating force, which can affect abatement of air pollution, is needed to achieve control of air pollution to a level acceptable to a community. A prerequisite of any proposed regulatory action to be applied by an outside force, however, is the need to define an acceptable level of pollution. One means of accomplishing the task is to apply an economic evaluation, in the form of a cost-benefit analysis, to the problem. Previous analyses of the economic aspects of air pollution have stressed only one side of the problem. That is, they have dealt only with the cost of control or the damages caused by air pollution. No analysis has combined both aspects into a meaningful analysis of the overall economic impact. The objective of this paper is to present a technique that can be used to find the level of pollution abatement in an area that balances the cost of controlling pollution of this technique and its results, it has been applied to the Washington, D. C. area to find the optimum level of particulate abatement. This method is generally applicable to any area in which an air pollution problem exists. (Author's Abstract)

1207 APTIC NUMBER 12394

Woodcock, Kenneth R. and Larry B. Barrett
ECONOMIC INDICATORS OF THE IMPACT OF AIR POLLUTION CONTROL: GRAY-IRON FOUNDRIES, A CASE STUDY. Preprint, Air Pollution Control Association, New York City, 23p., 1969. 6 refs. (Presented at the Air Pollution Control Association Annual Meeting, 62nd, New York, N. Y., June 22-26, 1969.)

Two gray-iron foundries are used as models to illustrate how economic indicators can describe the direct impact of air-pollution control expenditures and help determine what is efficient and equitable. A set of 14 indicators (financial, engineering, production effectiveness) is used in the analysis. By relating control costs to the various economic and engineering characteristics of a firm, the study provides a means for determining relative measures of impact, which is defined as either the value of any investment in an air-pollution control system or the value of capital and current costs allocated annually to the control system. Control costs for any given type of industrial process normally increase with the size of the process as well as the efficiency of the control system. In general, the impact indicator increases with increasing collection efficiencies of control systems. However, this direct relationship does not always hold true for the variable of size because certain economies are often found with increasing size. A discussion of these principles as measured by impact indicators is included. The indicators are capable of broader application than the presented comparison of two plants in the same industry. They can also be used to compare different plants in the same industry.

1208 APTIC NUMBER 16893

Boffey, Philip M.
RADIOACTIVE POLLUTION: MINNESOTA FINDS AEC STANDARDS TOO LAX. Science, 163(3871):1043-1044, March 7, 1969.

Following more than a year of public debate and controversy over pollution from a nuclear generating plant now under construction near Monticello, Minn., the Minnesota Pollution Control Agency (MPCA) announced last month that it will limit radioactive discharges from nuclear reactors to levels considerably below those currently allowed by the Atomic Energy Commission (AEC). If the proposed state restrictions survive a court test, this action could serve as a precedent and a catalyst for further efforts to crack down on radioactive contamination at the state level.

1209 APTIC NUMBER 11829

California Air Resources Board, Los Angeles
CALIFORNIA TEST PROCEDURE AND CRITERIA FOR MOTOR VEHICLE CRANKCASE EMISSION CONTROL. 47p., 1966.

The California standard for motor vehicle crankcase emissions is 0.1% hydrocarbons by weight of the supplied fuel. The standard refers to a composite sample representing idling at 30 mph and deceleration. The criteria for crankcase control devices are given and the procedure to be followed in certifying the devices is summarized. For demonstrating compliance with state standards, there will be bench testing of the flow characteristics of a device, flowby measurements, and tests to determine the ability of a device to operate efficiently for at least 12,000 miles without maintenance. Tests will be run with devices installed on at least five vehicles in each of the engine displacement classes for which approval is sought. Cars selected for use will be five-to six years old. Device performance will be measured at zero and 12,000 miles. Accelerated service tesing may be utilized as an alternative tc normal service testing. For each engine class, changes in engine air/fuel ratio attributable to the control device will be evaluated. Formulas are given for calculating the percent change for upstream, downstream, and combination devices. Instructions for submitting applications for certification of crankcase control devices are included in the appendix, together with a summary of legislation covering crankcase and exhaust control devices and a list of laboratories authorized tc test crankcase controls.

1210 APTIC NUMBER 12518

Goldsmith, John R.
HEALTH AND PHYSIOLOGICAL ASPECTS OF AMBIENT AIR QUALITY STANDARDS. Preprint, Air Pollution Control Association, New York City, 16p., 1961. 11 refs. (Presented at the Air Pollution Control Association Annual Meeting, 54th, New York, June 13, 1961, Paper 61-49.)

California ambient air quality standards are based on a set of three qualitatively different pollutant levels: adverse, serious, and emergency. The adverse level is that considered likely to lead to untoward symptoms and discomfort, such as eye irritation; to interfere with visibility; and to cause damage to vegetation. The serious level is defined as level of pollutants, or combinations of pollutants, likely to lead to insidious or chronic disease or to alterations in body functions in sensitive groups. The emergency level is that level of pollutants, or combinations of pollutants and meteorogical factors, likely to lead to acute sickness or death for a sensitive group. The process of setting the standards places unusal reliance on physiological and epidemiologic studies and on data gathered from eye irritation panels. In setting carbon monoxide standards, for example, the deleterious effect of the inactivation of 10% of body hemoglobin on persons with circulatory or respiratory insufficiency was considered. Only one half of hemoglobin inactivation should be allocated to community air pollution. Physiologic data were consulted with the conclusion that 30 ppm per 8 hrs might produce this five percent level. Another approach to the standards was to consider the effect of environmental exposure in terms of four arbitrary levels of health; the highest attainable level; the level required for gainful employment; the level required for noninstitutional living; and the level incompatible with survival.

1211 APTIC NUMBER 17326

Hishida, Kazuo
CONSIDERATION ON STANDARD OF SPECIAL CONTROL OF FLUE GAS IN LAW OF AIR POLLUTION CONTROL. (Taiki osen boshiho no tokubetsu haishutsu kijun no kangaekata). Text in Japanese. Netsu Kanri (Heat Management: Energy and Pollution Control), 22(1):3-11, Jan. 30, 1970. 2 refs.

The interpretation of the Standard of Special Control of Flue Gas which constitutes part of the Law of Air Pollution Control and has been recently revised is reviewed. In its original form, the standard required a small plant emitting a negligible quantity of gaseous sulfur oxides to observe the same density limits as large plants emitting considerable quantities of smoke dust. The new standard requires a plant to be responsible according to the degree of sulfur oxides in the absolute mass emission. This is interpreted to mean that chimney height must be sufficient for atmospheric dispersion. The decision is based on the theory that maximum density on land is in proportion to the square of effective emission height and to wind speed, as calculated by a dispersion formula. For example, when a 50 m chimney is compared with one 100 m high, the maximum density is 4:1 and not 2:1. The government is allowing plants five years to comply with the new standard. Ordinary emission standards will also be gradually enforced. The standards are correlated.

1212 APTIC NUMBER 17375

Hodge, Harold C. and Frank A. Smith
AIR QUALITY CRITERIA FOR THE EFFECTS OF FLUORIDES ON MAN. J. Air Pollution Control., 20(4):226-232, April 1970. 42 refs.

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Atmospheric and industrial concentrations of fluoride are considered, together with the effects of fluoride on man. Urban concentrations of fluoride range from less than 0.2 micrograms/cu m to 1.9 micrograms/cu m. Depending on the processes involved, factories using fluorides release to the atmosphere elemental fluorine (F2), soluble gaseous fluorides (HF), and soluble or insoluble fluoride dusts. Industrial air concentrations of fluorides range from a fraction of a milligram of fluoride per cu m to values mostly less than 10 mg/cu m. Average urinary F concentrations not exceeding 5 mg/l, which corresponds approximately to a daily intake of 5 mg, are not associated with osteosclerosis in workmen. The amount of fluoride retained by an individual inhaling air containing 2.5 mg of fluoride dust per cu m (the current threshold limit value) is approximately 5-6 mg. The available evidence indicates that, with a few exceptions, the health of persons in the vicinity of factories emitting fluoride fumes or dust is not adversely influenced. However, some types of vegetation are highly susceptible to the effects of fluorides and an air quality standard to protect vegetation will be far lower than that encountered in the factory. If the standard is set at 10 ppb, the probable daily human intake would be 0.16 mg, which is far below the level required for the production of clear-cut effect in the human.

1213 APTIC NUMBER 11607

King, W. Julian, Gary Sholders, John Lucan, Wm. Tierney, Richard Crook, Sandor Padilla, and T. S. Chow
AUTO EXHAUST GAS ANALYSIS AND CONTROL. In: Air Pollution Research (Progress Summary). California Univ., Los Angeles, Dept. of Engineering, Rept. 68-39, p. 93-101, Sept. 1968. 2 refs.

Test procedures for analyzing automotive exhausts are considered with reference to federal and California standards. Federal standards provide that the exhaust volume from 1970 and later model cars be computed in terms of vehicle weight and with formulas derived from tests on 1968 and older models. The standards should but do not consider the importance of the rate of exhaust gas discharged per vehicle per mile. These rates are even more important than the prescribed maximum limits for individual pollutants, since limiting the exhaust volume controls the emission of all pollutants, including those not presently recognized or controlled as to concentration. The California standards do not specify test procedures for determining hydrocarbon and carbon monoxide values. Two methods are proposed for measuring true exhaust volumes: total exhaust collection with plastic bags and computation from measured fuel consumption by means of a gravimetric device.

1214 APTIC NUMBER 17371

McCabe, Louis C.
CAN ONE STATE'S CODE SOLVE ANOTHER STATE'S PROBLEMS? Environ. Sci. Technol., 4(3):210-213, March 1970. 5 refs.

The development and application of Rule 54 of Los Angeles air pollution regulations is reviewed. The rule provides mass-rate tables which specify maximum allowable dust and fume discharges; process weight is defined as total weight of raw materials entering a process, including solid fuels but excluding liquid and gaseous fuels and combustion air. The mass-rate tables were designed to meet the needs of Los Angeles County; much difficulty has arisen from the adoption of these tables by other air pollution authorities as a result of their failure to recognize the specific needs of their communities, either in terms of the source reductions required to meet air quality goals or the technological or economic feasibility of local industrial compliance. Alternative approaches to particulate control are available, and each community should tailor its approach to its own needs and capabilities.

1215 APTIC NUMBER 12237

Paulson, R. A., B. S. Carpenter, and W. F. Schmidt
ANALYSIS OF STANDARD REFERENCE MATERIALS. In: Microchemical Analysis Section: Summary of Activities July 1967 to June 1968. National Bureau of Standards, Washington, D. C., TN-455, p. 109-111, Oct. 1968.

The National Bureau of Standards has certified two new standard reference materials for use in determining the sulfur content of residual fuel oil. The standards are designated as NBS SRM 1621 and 1622. As determined by the combustion of one-gram samples in an oxygen bomb, followed by gravimetric titration as barium sulfate, the reference fuel oils contain 1.048% and 2.13% sulfur, respectively. No problems should arise during the routine weighing of analytical samples or their storage; after seven days of exposure at room temperature, the percent loss of volatile constituents from six-gram samples was 1.11 for SRM 1621 and 1.10 for 1622. The carbon, hydrogen, water, sediment, and ash contents of the reference fuel oils are given.

1216 APTIC NUMBER 18004

Pelizzoni, W. J., H. S. Ford, R. C. Pascoe, C. B. Hudson, R. D. Henderson, K. D. Mills, J. H. Johnson, and William G. Agnew
AESTHETIC DIESEL SMOKE LEVELS IN BOTH ACCELERATION AND LUG DOWN ARE SET TO BEGIN IN JANUARY 1970. S.A.E. (Soc. Automot. Engrs.) J., 77(4):58-61, April 1969.

As of January 1970, engine manufacturers must certify that all new diesel engines installed in highway vehicles over 6000 lb gvw meet federal smoke standards. The federal standard fixes maximum smoke levels during both acceleration and lug down in a dynamometer test that simulates actual vehicle on-the-road conditions. The test cycle and restrictions are discussed. While this federal standard assures a supply of new engines of demonstrated smoke control, it does not apply to engines after they enter service. Once in the vehicle, the engines enter the state environment, where codes at present vary from no smoke limits to rigid maxima.

1217 APTIC NUMBER 12313

Stephany, H., and P. Hons
CAPACITY MEASUREMENTS OF DUST COLLECTORS. (Leistungsmessungen an

Enstaubern). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2066, 21p., May 1966. 38 refs. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Into. Services, 90p.

'Capacity Measurements of Dust Collectors' is a revised editon of 'Capacity Tests for Dust Collectors', published in 1949. Its objective is to prove a procedure for measuring the efficiency of dust collectors, as well as dust emissions to the atmosphere in such a way that unambiguous and comparable results can be obtained. The directive reviews the process of selecting measuring planes and defining measurement zones and the values important with respect to capacity measurements. The values are gas composition, including moisture, condition, and density; the gas stream; the dust contents used to calculate the mass of dust which enters a collector with the dirty gas and the mass of dust which leaves it; the mass of dust retained in the collector; the properties of the dust; collection efficiency; energy consumption; and consumption of materials. In this volume, special emphasis is given to determining dust content in flowing gases. New additions to the guidelines are sections describing the construction and operation of the best known dust measuring unit, errors likely to arise during measurements, and the effect of these errors on results.

1218 APTIC NUMBER 12312

Baruch, Stephen B., Frank L. Cross, Jr., and Roger W. Ross
THE SYSTEMS APPROACH IN INDUSTRIAL AIR POLLUTION CONTROL DECISIONS. Preprint, Air Pollution Control Association, New York City, 12p., 1969. 4 refs. (Presented at the Air Pollution Control Association Annual Meeting 62nd, New York, June 22-26, 1969.)

Air pollution control legislation in the United States is discussed; industry's increasing awareness of the need to control environmental pollution is reviewed in the light of the Air Quality Act of 1967. Systems analysis is suggested as a method by which industrial management can arrive at decisions concerning pollution abatement. This approach emphasizes the acquisition and processing of information by the engineering department, following the decision of management to construct a new industrial facility or modify an existing one. Information is gathered from a number of sources such as site selection surveys, searches of existing and proposed regulations, analysis of processes, and a study of air pollutant control techniques documents. Information that has been acquired is then organized into a form that enables management to make a decision. It must be processed to reflect the priorities and requirements of the particular industry.

1219 APTIC NUMBER 17396

AIR POLLUTION ADMINISTRATION UNDER PRIMARY LAW OF PUBLIC NUISANCE CONTROL. (Kogai taisaku kihonho ka no kogaigyosei). Text in Japanese. Doboku Gakkaishi (J. Japan Soc. Civil Engrs.), 55(3): 44-48, March 15, 1970. 6 refs.

Major administrative efforts to obtain the degree of air pollution control envisaged by the Primary Law of Public Nuisance Control are reviewed. The ambient emission standards established by the law provide the basic direction for air pollution administration activities, and reasonable criteria for all judgements. In accord with control efforts, emission sources are subject to air monitoring and other programs. Four remarkable trends characterize the enforcement of the emission standard. The control system concerned with density restrictions on individual pollution sources is having a promising effect on restricting mass emissions. Where air pollution exceeds the given emission standard, authorities can withhold approval of new plant construction. Automotive emission standards have been set, and local governors are obligated to measure pollution levels from this source. Polluted areas can be so designated in advance of plant construction. The Air Pollution Control Program is another significant abatement project. It is designed to coordinate city planning with well-defined programs of land use. Control efforts are reflected in increased imports of lower-sulfur content heavy oil, the improved technology of sulfur oxides recovery or reduction, and the increase in the consumption of liquid natural gas.

1220 APTIC NUMBER 18024

ILLINOIS MOVES ALONG IN FIGHT FOR CLEAN AIR. LEGISLATIVE STUDY COMMITTEE RECOMMENDS AIR QUALITY STANDARDS. Environ. Sci. Technol., 3(4):319-320, April 1969.

The Joint Air Pollution Study Committee of the Illinois General Assembly, began work in 1967. They have issued a final report calling for the following courses of action: Establishment of a Department of Environmental Pollution Control; abolishment of the present nine man air pollution control board; appointment of a superintendent of air pollution control; and endorsement of nine recommendations for air quality standards.

1221 APTIC NUMBER 18020

STATES ARE KEY IN POLLUTION ABATEMENT. Environ. Sci. Technol., 3(3):223-228, March 1969.

With their constitutional authority and the unique resources at their disposal, states appear to be in a favored position for dealing with pollution. The states' earliest involvement in pollution control was in water. Some states had control programs as early as the 1920's. However, it was the Water Quality Act of 1965 that coerced all states into major water pollution control efforts. Air pollution control activity has been more recent. The effect of the Clean Air Act has been to prod states into action by giving the Federal Government a role in control of both interstate and intrastate air pollution abatement, and by providing grants for workable programs. Some of the state programs are discussed and the fiscal 1967 grants for pollution control programs are tabulated.

1222 APTIC NUMBER 12444

Gibbs, T. L.
THE CONTROL OF DUST IN TERMS OF PART IV OF THE ATMOSPHERIC POLLUTION PREVENTION ACT, 1965. Council for Scientific and Industrial Research, Pretoria (South Africa), Conf. Air Pollution, Capetown, South Africa, 1967, 16p. 4 refs. (Paper no. 4.)

Part IV of the Atmospheric Pollution Prevention Act has as its object the control of mineral dust resulting directly or indirectly from mining operations or other processes involving the handling or treatment of rock, ore, or any mineral substance. The most immediate problem is the control of dust from mineral waste or tailing dumps. Since the start of gold mining, about 3000 million tons of rocks have been crushed and, as only an infinitesimal fraction of the tailings were returned to underground excavations, there are enormous mine dumps in gold mining areas. The dispersed dust is a nuisance to residential and industrial areas. The dispersed dust is a nuisance to residential areas that lie between and all around the dumps. The legislation places the responsibility for the prevention of the dispersion at the door of mine operators. However, government research laboratories maintain a 'vegetation unit', equipped with the necessary agricultural machinery to provide a vegetation planting service to mines. Experimental work has demonstrated the effectiveness of this method of stabilizing mine dump surfaces. The planning, programming, and progress of this work is described.

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1223 APTIC NUMBER 17379

Grotterod, K.
AIR AND WATER POLLUTION IN SWEDEN: THE PROBLEM, THE EFFORTS AND THE PROGRESS. Pulp Paper Mag. (Quebec), Can., 71(5):64-66, March 6 1970. (Presented at the 5th Paper Industry Air and Stream Improvement Conference, Toronto, Ontario, Oct. 21-23, 1969.)

Like most other developed countries, Sweden has found that its lakes and rivers are being choked by municipal sewage and industrial wastes. Determined efforts to improve conditions have resulted in significant improvements. It is forecast that within 10 years, all municipal sewage plants will be equipped to remove nutrients. In the pulp and paper industry, pollution control measures have been in the form of tight control of kraft mill operations and elimination or reduction of sulfite liquor discharge into lakes and rivers. For recovery of suspended solids, internal mill water systems have been tightened up. Further improvements have been achieved by the use of savealls, clarifiers and, when necessary, lagoons. As most of the recipient waters are slow moving or stagnant, emphasis is placed on dispersion. Many mills are required to install long pipelines with dispersion nozzles for proper mixing of effluents with the recipient water. The cost to industry of complying with new environmental legislation is estimated in excess of 200 million dollars. Of this sum, about 140 million dollars will be spent by the pulp and paper industry. The legislation covers discharge of effluent, solids or gas from land, building or installation into water courses, lakes, or other waters; use of land, building or installation in a manner which can cause pollution of water courses, lakes, or other waters; and use of land, building or installation in a manner which can cause disturbance to the surroundings by air pollution, noise vibration or other such

1224 APTIC NUMBER 11951

Konno, Akira
AIR POLLUTION AND FUTURE CITY PLANNING. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 1(1):7-12, 1966. Translated from Japanese. 28p.

Air pollution control measures are necessary at the source which produces the pollutants, at the point where they are emitted, at the stage of diffusion, and at the point where the pollutants finally return to the ground. The control measures for existing urban areas involve staking out industrial zones where all residential facilities ought to be removed and creating so-called green belts or vacant lots. In the case of new development areas, the air pollution situation must be studied and it must be decided which enterprises are allowed into the area and the location. Air pollution sources should not be located in the main direction of the wind to the city. Large structures or buildings should not be erected in the windward and leeward directions of a source. The stack height of an air pollution source should not be equal to the height of the surrounding buildings. Two green belts should be created around pollution sources. Trunk roads should run parallel to the main direction of the wind. The area between the green belts should be reserved for commercial purposes only. Continuous observations of the meteorological conditions in the area are required. The knowledge of the dispersion conditions and the possibility of temperature inversions must be improved. The relationship between the general meteorological conditions and the meteorological conditions in the vicinity of buildings must be studied. The pluming of the waste gases, interference phenomena in an area with many emissions, and the influence of the design and shape of buildings on the degree of pollution and on the distribution of concentration should be the object of intense investigations.

1225 APTIC NUMBER 16443

Kudinov, O. V.
ON THE PLANNING OF SANITARY PROTECTION ZONES. (O planirovochnoy organizatsii sanitarno-zashchitnykh zon). Text in Russian. In: Sanitation Measures Against Air and Water Pollution in the Planning of Cities. (Ozdorovleniye vozdushnogo i vodnogo basseynov gorodov). Government Committee on Civil Building and Architecture (ed.), Lecture series no. 2, Kiev, Budivel'nik 1968, p. 33-37.

General factors such as prevailing wind direction and speed, relative arrangement of industrial chimneys, the presence of vegetation, and geographical relief as they relate to air pollution are discussed. The placement of secondary industrial enterprises relative to a basic industrial pollution source is discussed in terms of maximum permissible concentration for the various harmful substances involved. Considerations related to agricultural land embraced by the sanitary protection zone are touched upon.

1226 APTIC NUMBER 12445

Manderslоot, W. G. B.
RESEARCH AND AIR POLLUTION CONTROL. (Navorsing en lugbesoedilingsbeheer). Text in Dutch. Council for Scientific and Industrial Research, Pretoria (South Africa), Conf. Air Pollution, Capetown, South Africa, 1967, 16p. 30 refs. (Paper no. 5.)

The implementation of an air-pollution control program requires a knowledge of the following: minimization of pollutant production, removal of pollutants from gas streams and their subsequent disposal, dispersal of pollutants in the atmosphere, and tolerable concentration levels. To a considerable extent, this knowledge is obtainable from the literature and from relevant facilities. However, local conditions (particularly atmospheric) must be taken into account. In South Africa, local research organizations are geared to render the necessary advisory services and to undertake the measurement and evaluation of emissions and pollutant concentrations, as well as the analysis of atmospheric conditions. (Author summary modified)

1227 APTIC NUMBER 12376

Hartland, L.
EMISSIONS FROM GASOLINE MOTOR VEHICLES. Inst. of Mechanical Engineers, London (England), Automobile Div., Symp. Motor Vehicle Air Pollution Control, London, 1968, 4p. (Nov. 25-26, Paper 1.)

The British Technical Council (B.T.C.) was started in 1963 and is composed of single representatives from each of the major motor and petroleum companies to provide cooperative consultation and action on technical problems. In the same year the B.T.C. and similar bodies from other West European countries formed the Co-ordinating European Council (C.E.C.). The activities of these organizations in the air pollution matters are outlined, and California and U. S. Federal regulations on pollution are reviewed. The Bureau Permanent International des Constructeurs d'Automobiles, composed of manufacturers' associations from all countries producing motor vehicles, made a strong recommendation to the Economic Commission for Europe in 1966 that air pollution regulations in terms of procedures and levels should be standardized for all countries of Europe. The recommendation was accepted, and subsequently the B.T.C. Fuels Committee contributed significantly to the final European recommendations for control of exhaust emission from gasoline-engine cars and derivatives, to be applied as a type test acceptance. In new U. S. regulations, levels of emissions are controlled on a basis of mass flow instead of proportion of total exhaust gas volume as previously; this aligns with the European method. Although diesel emissions do not constitute a public health hazard the opacity of diesel smoke can be a driving hazard. Odor and deposition from the smoke are also problem areas. Thus the various national and international organizations have more recently initiated programs to design and implement control of diesel emissions as well.

1228 APTIC NUMBER 16445

Pertsik, Ye. N. and Yu. P. Shulenin
PLACEMENT OF LARGE INDUSTRIAL COMPLEXES HARMFUL FROM THE POINT OF VIEW OF SANITATION. (Razmeshcheniye krupnykh promyshlennykh kompleksov, vrednykh v sanitarnom otnoshenii). Text in Russian. In: Sanitation Measures Against Air and Water Pollution in the Planning of Cities. (Ozdorovleniye vozdushnogo i vodnogo basseynov gorodov). Government Committee on Civil Building and Architecture (ed.), Lecture series no. 2, Kiev, Budivel'nik, 1968, p. 26-30.

Three hypothetical situations relating to the location of industrial enterprises with respect to nearby living areas are presented: a large-scale complex situated along the banks of a river with prevailing wind parallel to the river bed; a coal-mining region; and a number of thermoelectric stations with nearby strip coal mines in complex combination with industrial buildings and dwellings. The complexity of planning for such areas and the need for joint efforts by hygienists, technologists, climatologists, geomorphologists, and other specialists under direction of the State Committee on Construction Works and the Ministry of Health are stressed.

1229 APTIC NUMBER 11694

Public Health Service, Washington, D. C., National Air Pollution Control Administration
REPORT FOR CONSULTATION ON THE BUFFALO AIR QUALITY CONTROL REGION. 40p., Feb. 1969.

In accordance with the Air Quality Act of 1967, urban and engineering factors in the Buffalo area are reported as background for consultation between Federal, State, and local officials prior to the designation of the air quality control region proposed in the report. The proposed region would consist of Erie and Niagara counties in New York State. These two counties contain all the major pollution sources in the area except for Canadian sources, which were omitted in the emissions inventory. Furthermore, ambient air pollution appears to extend no further than the boundaries of the two counties. The proposed region would be valid for future as well as present needs, since there is sufficient rural land surrounding Buffalo and Niagara Falls (N. Y.) to absorb expected population growth for at least a decade. The region is compatible with unified governmental administration of pollution control regulations, since Erie and Niagara counties at present conduct the only two important county air pollution programs in the area, and have been linked through the planning functions of the Regional Planning Board. The two are considered to form a natural economic and cultural unit. Topography, meteorology (including wind rose data), and the sulfur oxides, particulate, carbon monoxide emissions are presented.

1230 APTIC NUMBER 11786

Public Health Service Washington, D. C., National Air Pollution Control Administration
REPORT FOR CONSULTATION ON THE METROPOLITAN PITTSBURGH INTRASTATE AIR QUALITY REGION. 57p., Feb. 1969. 6 refs.

In accordance with the Air Quality Act of 1967, urban and engineering factors in the metropolitan Pittsburgh area are reported as background for consultation between federal, state, and local officials, prior to designation of the air quality control region proposed in the report. The proposed region consists of Allegheny, Armstrong, Beaver, Butler, Lawrence, Washington, and Westmoreland counties in Pa. An emission inventory showed that the greatest emission densities occur in or near Pittsburgh, with other high areas along the Allegheny, Monongahela, Ohio, and Beaver rivers where urban and industrial concentrations are greatest. The application of a diffusion model to existing air quality data indicated that the influences of topography on meteorology in the area produce stable atmospheric conditions conducive to the build-up of high pollutant concentrations. Dispersion of emissions from sources in the valleys is restricted vertically by atmospheric inversions and laterally by the valley sides. Particulate pollution is a particularly severe problem. All the proposed counties except Washington are members of the Southwestern Pennsylvania Regional Planning Commission, and form a distinct banking region, a cohesive trade area, and a single labor market with a great deal of commuting occurring across county lines. The boundaries of the region were selected to minimize pollutant transport boundary problems. The proposed region would be valid for projected future as well as present population control needs, and is compatible with unified governmental administration of pollution programs as required by the Air Quality Act.

1231 APTIC NUMBER 11811

Roberts, Thomas R.
AN OVERVIEW OF THE POLITICS OF AIR POLLUTION CONTROL. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 157-168, 1968. 35 refs.

The failure of the California legislature to enact a stringent smog control bill is examined in terms of rural opposition, bureaucratic indifferences, and pressure groups representing the automobile industry. Also discussed is the lack of coordination between three departments with crucial control responsibilities: the California Air Resources Board, which is responsible for the certification of control devices and emission standards; the California Highway Patrol Department, which licenses and inspects the official installation-inspection stations for control devices; and the California Department of Public Health, which issues recommendations for air quality standards. These agencies, which adopt varying and sometimes contradictory regulations and policies, are unable to collaborate on imaginative alternative pollution policies. The development of a smog control policy is additionally hindered by the hostility between the Air Resource Board and the Los Angeles County Air Pollution Control District. As a solution to the smog problem, a massive public education campaign is proposed to inform the public of the economic, medical, psychological and aesthetic costs of air pollution. Motorists must be willing to maintain their smog control devices before and after inspection.

1232 APTIC NUMBER 11812

Rowse, Ruth
ASSEMBLY BILL 357: THE PURE AIR ACT OF 1968. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 169-175, 1968.

Assembly Bill 357, passed by the California legislature in 1968, is the first air pollution bill to specify exact motor vehicle emission standards for hydrocarbons, carbon monoxide, and nitrogen oxides. The political significance of the bill is examined. Because AB 357 is stricter than any existing or proposed federal legislation, it cannot become law until California demonstrates that it has an 'extraordinary' motor vehicle pollution problem and that the standards adopted to meet these unusual conditions are technologically and economically feasible. Whether the waiver is granted by the Department of Health, Education, and Welfare depends largely on the definition of 'technolcgical feasibility,' which in turn raises complex legal and technical questions. Industries define the term as 'commercial capability at the time of manufacture,' which means that the manufacturer can sell almost every car made. Based on tests for 1968 models, about 31% of the Detroit cars meet the 1970 standards, so some pollution experts insist that this demonstrates technological feasibility. (Author abstract modified)

1233 APTIC NUMBER 11788

Secretary of Health, Education, and Welfare, Washington, D. C.
AIR POLLUTION ABATEMENT BY FEDERAL FACILITIES. Rept. to the U. S. Congress Pursuant to Public Law 90-148 the Air Quality Act of 1967, 83p., Jan. 1969.

A report of the Secretary of Health, Education, and Welfare to The United States Congress pursuant to Public Law 90-148, The Air Quality Act of 1967 includes the abatement plan, exemptions, remedial actions, Washington, D. C. metropolitan area, miscellaneous activities, conclusion, and appendices. As called for by Executive Order and Bureau of the Budget, the departments and agencies submitted revisions of their original phased and orderly plans on July 1, 1968, and also, for the first time, furnished reports of progress on projects which could be funded within available appropriations. The revised plans are concerned principally with proposed abatement actions to be undertaken during FY 1970. The detailed proposals for abatement activities which have been recommended for funding by the Bureau of the Budget for FY 1970 are appended. On June 20, 1968, the Secretary of Health, Education, and Welfare announced that 32 Air Quality Control Regions would be designated during the next 12 months. These regions, in the order in which designation is expected to occur, are presented. A summary of the report reveals that 442 remedial actions were reported for 387 installations located in 45 states. The remedial actions are tabulated. It is concluded that sufficient funding will enable prompt abatement of air pollution from Federal establishments.

1234 APTIC NUMBER 11669

Spaite, Paul W.
THE FEDERAL PROGRAM IN DEVELOPMENT OF METHODS TO CONTROL POLLUTION FROM STATIONARY SOURCES. Preprint, American Chemical Society, Washington, D. C., 10p., 1968. (Presented at the American Chemical Society, Southwest Regional Meeting, Austin, Texas, Dec. 4-6, 1968.)

A Federal program was launched in 1967 to control pollution from stationary sources, designed to develop full-scale equipment for application in the shortest possible time; to develop new processes with long-range potential; and to define problems associated with broad areas of air pollution control technology. The program includes about 70 projects involving industry, research institutes, universities, engineering companies, state agencies, other Federal agencies, and other companies. The projects were grouped into three general classes: activities associated with large-scale prototype and demonstration studies of processes for control of sulfur oxide pollution from combustion process; new process development projects aimed at developing processes having long-range potential greater than that of the first processes to be studied on large-scale equipment; and problem definition studies in which the systems analysis approach is used to assess broad areas of pollution control technology. First priority is being given to large-scale studies that are needed to bridge the gap between the large amount of bench research of processes to control sulfur oxide pollution and operating control processes. Three approaches selected for the first generation of large-scale studies were limestone or dolomite injection, including dry processes and injection coupled with water scrubbing; alkalized alumina sorption, and processes that would treat pyrite-coal mixtures derived from deep cleaning of coal to produce utilizable heat, sulfur or sulfuric acid, and

possibly other byproducts. There is also a need to consider the applicability of sulfur control technology to control other sources of sulfur oxide pollution, such as primary smelters, refineries, and sulfuric acid plants, and to give attention to other pollutants. Problem definition studies were also being conducted.

1235 APTIC NUMBER 11810

Staisey, Consuelo E.
A HISTORY OF SMOG CONTROL LEGISLATION. In: An Educational Experiment in Self-Direct Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 137-156, 1968. 27 refs.

The activity of California state and local governments with respect to abatement of smog in the Los Angeles area is reviewed. In 1953, the first year of state action, Assembly bills were passed authorizing the establishing of emission standards and air quality standards. No direct control measures for vehicular exhaust were instituted during the 1950's, but important changes occurred. Los Angeles County abandoned the concept of local control in favor of the alternative goal of state control. In 1960, the State Motor Vehicle Pollution Control Board was created and assigned the responsibility of testing and certifying automobile emission control devices. The impact of this legislation was noticeable: major car corporations began installing crankcase devices on cars to be sold in California. Strong legislative interest like that demonstrated in 1960 did not reoccur until 1963, when a bill was introduced which proposed a system for the installation and inspection of motor vehicle control devices. Subsequent amendments relating to cost and enforcement procedures seriously weakened the bill. The Pure Air Act of 1968 similarly sidestepped the issue of enforcement and lowered the cost ceiling on car exhaust devices, thereby reducing development prospects. If clean air is restored to the Los Angeles area, it may be as the result of other bills that give serious consideration to alternatives to the internal combustion engine.

1236 APTIC NUMBER 11885

Stanley, William J.
AIR RESOURCE MANAGEMENT IN THE CITY OF CHICAGO. POLLUTION INCIDENT CONTROL PLAN. Preprint, Air Pollution Control Association, New York City, 15p., 1968. (Presented at the Air Pollution Control Association, Annual Meeting, 61st, St. Paul, Minn., June 27, 1968.)

The approach used by the City of Chicago, Department of Air Pollution Control, to design and implement a Pollution Incident Control Plan (referred to as Operation Hot-Line) is explained whereby action can be taken to reduce the level of pollution during stagnation periods within the City. A program developed with the Commonwealth Edison Company and the one-hundred largest producers of sulfur dioxide, and the application of computer simulations to determine the range of program controls are described in detail. Operation of an air monitoring program is explained and development of an air pollution dispersion computer model is proposed. Control and emergency procedures which incorporate three separate alert stages are described. The need for extensive air-quality and meteorological data gathering, cooperation with the Environmental Services Weather Bureau, and an in-house meteorological capability are stressed. (Author abstract modified)

1237 APTIC NUMBER 12200

Trauth, C. A., Jr.
A SYSTEMS APPROACH TO CONTAMINATION CONTROL. Atomic Energy Commission, Washington, D. C. and National Aeronautics and Space Administrations, Washington, D. C., Contamination Control: Current and Advanced Concepts in Instrumentation and Automation, p. 307-334, 1967. 17 refs.
CFSTI: SC-M-68-94

A framework is presented for the development of a theory of contamination control applicable to all specific contamination problems and encompassing all types of contamination control techniques. The theory is intended to provide a 'best' choice of methods needed to achieve control objectives on an optimal utility-benefit basis. Control problems are approached by a 'systems philosophy' which is analogous to the scientific method and, therefore, a point of view rather than a specific resolution scheme. To implement the systems philosophy, the framework links primary objectives (original problem objectives) to 'actionable' objectives (directly achievable objectives). The elements occurring in this 'objective hierarchy' framework can be related to those occurring in the systems philosophy. The abstract approach used is illustrated by application to two partial examples: the probability of failure from particulate contamination of a value and the analysis of the planetary quarantine problem. The theory is essentially untried, since it has not been used to obtain a complete set of actionable objectives or 'best' means of problem resolution. Nevertheless, the approach is considered promising for planning contamination control on a cost-effectiveness basis.

1238 APTIC NUMBER 12329

Yamada, Victor M.
CURRENT PRACTICES IN SITING AND PHYSICAL DESIGN OF CONTINUOUS AIR MONITORING STATIONS. Preprint, Air Pollution Control Association, New York City, 21p., 1969. (Presented at the Air Pollution Control Association, Annual Meeting, 62nd, New York, N. Y., June 22-26, 1969.)

Current practices in siting and physical design of continuous air monitoring installations were determined by a survey of air pollution control agencies in the U. S. The typical air pollution control agency budget is $125,000 and it has two continuous monitoring stations. Network objectives are to obtain current readings and to evaluate long-range trends. The network obtains data on particulate matter, sulfur dioxide, carbon monoxide, nitrogen oxides, oxidants, and hyrocarbons. Meteorological data obtained include wind speed and direction and relative humidity from instruments at monitoring stations and the local weather bureau. The typical monitoring station collects data on general air quality and localized effects. The main sample inlet line is vertical and projects five ft above the roof. The inside

diameter of the line is 1/2 in., and the line is 14 ft long. The inlet line is made of glass. A secondary line is used for measuring particulate matter with a tape sampler. The station is located on the ground floor and is situated in a commercial land-use area. (Author summary modified)

SOCIAL ASPECTS

1239 APTIC NUMBER 11813

Cooley, Nino, Bonnie Sun, and Robert Mintz
THE ROLE OF THE PUBLIC IN THE CONTROL OF AIR POLLUTION. PART I. In: Air Pollution Project: An Educational Experiment in Self-Directed Research, Summer 1968. Associated Students of the California Inst. of Tech., Pasadena, p. 177-194, 1968. 5 refs.

The role of citizens' groups and individual citizens in promoting air pollution control legislation in California is discussed. Despite the committments these people have made no air pollution control, their efforts are seen as ineffective. This is attributed to the lack of inter-group communication or organization, to duplication of efforts, and to the failure of various groups to overcome public apathy to the smog problem. Suggestions are offered for coordinating the activities of antismog groups, making effective use of group influence, and informing the public of the necessity for control programs.

1240 APTIC NUMBER 18022

UNION OFFICIALS LEARN ABOUT AIR POLLUTION. Environ. Sci. Technol., 3(5):429-430, May 1969.

The first union sponsored, national conference on air pollution was held in Washington, D. C. by the United Steelworkers of America in cooperation with federal officials of the National Air Pollution Control Administration. A primary purpose for the conference was to inform the district and local union officials present of the role they, and their respective unions and communities, play in U. S. pollution abatement. The conference stressed the idea that more responsible citizen participation is a must in curbing air pollution, and that the union officials are in a key position to encourage such participation.

1241 APTIC NUMBER 11950

Hayashi, Yujiro
IMPORTANCE OF SOCIAL CONSUMPTION. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 1(1):5-6, 1966. Translated from Japanese. 6p.

The per capita income in Japan, which was 690 dollars in the fiscal year 1965, will about triple over the next 20 years. This does not mean, however, that the individual property will increase as much, since a good deal of the individual income will be spent for the maintenance of clean air and water. Some day, a special tax called air tax will have to be raised from each individual to pay for the enormous costs of anti air pollution measures. Such measures require re-orientation of the common thinking from the private-property-oriented-society to a society concerned about such matters and willing to contribute to this cause a certain percentage of their income.

1242 APTIC NUMBER 18030

Hoelscher, H. E., W. R. Turkes, and J. I. Abrams
EDUCATORS HAVE VITAL ROLE IN ENVIRONMENTAL ENGINEERING. Environ. Sci. Technol., 3(3):235-240, March 1969.

The environment of man represents an acknowledged challenge of critical importance. As a major effort toward total-environment study, the University of Pittsburgh School of Engineering proposes the establishment of a University Center for Urban and Environmental Studies. The analysis of the university's relationship to the community and of the engineering schools' role in this relationship is presented.

1243 APTIC NUMBER 12436

Jaramillo, Edward J., Jr. and George A. Kladnik
PUBLIC SECTOR PROBLEMS SUITABLE FOR SYSTEMS ENGINEERING RESEARCH. (FINAL REPORT). Stanford Univ., Calif. School of Engineering, NSF Grant GK-4601, 156p., Summer 1968. 143 refs.
CFSTI: PB 182087

A study was performed to seek problems in the public sector which are suitabe for systems engineering research. The purpose was to introduce the concept of graduate team systems engineering courses, to bring the public sector problems to the attention of the universities, and to help create greater participation of the universities in the solution of the nation's problems. The objectives were to single out critical domestic problems whose solution might be attempted by systems engineering techniques, and to provide leads on key people with special experience who might be able to assist universities by lectures or other guidance. The transportation area provided problems which included joint development of highways and communities for more efficient utilization of urban land, better transportation for rapid transit systems, emergency highway rescue systems, air and sea terminals, and better air traffic control systems. A great need exists for information systems in the fields of medicine, transportation, urban planning, and library science. Postal problems suitable for systems engineering research included comprehensive regional design studies, design of major postal facilities, design of freight and parcel post handling, and design of a satellite-oriented facsimile mail system. In the field of ecology, research is needed for regional air pollution control and elimination systems, continuous air monitoring systems, novel solid waste disposal systems, regional sewage disposal systems, sewage treatment facilities, river basin studies, and recreational facilities. In the area of community life, problems arise in the design of new cities, renovation of old cities, housing in poverty areas, and delivery of health and medical services. Agriculture needs the design of resource systems, mechanized farming systems, food and crop processing systems, crop protection systems, and crop monitoring systems. All problem areas were discussed in detail.

1244 APTIC NUMBER 12197

Louisville Univ., Ky., Urban Studies Center
REPORT TO FALLS OF THE OHIO METROPOLITAN COUNCIL OF GOVERNMENTS ON URBAN DECISIONS PROJECT. (FINAL REPORT). 44p., 1968.

CFSTI: PB 179607

The report presents the procedure used in Urban Decisions, a summary of priority indicators for the Falls of the Ohio Metropolitan Council of Governments, and answers to the questionnaires contained in the six Urban Decisions papers. The six papers prepared for the series, around which centered discussion and answers, were concerned with government, physical environment, neighborhood environment, social environment, economic environment, and educational environment. Over 3000 citizens participated. Returns from the questionnaires form every portion of the Louisville areas but with a higher than average return from higher socioeconomic areas. The five highest ranking problems of metropolitan concern were air pollution, water pollution, public schools, and civil rights. As an outgrowth of the program, the Urban Decisions alumni organized five task forces around five high priority subject areas of community concern: economics, education, social environment, pollution, and transportation. Preliminary reports of these task forces are included. Questionnaire samples are given.

GENERAL AND MISCELLANEOUS

1245 APTIC NUMBER 16865

Bell, Alan
THE WORLD HEALTH ORGANISATION AND AIR POLLUTION CONTROL. Clean Air (J. Clean Air Soc. Australia New Zealand), 3(2):9, 11-14, June 1969. 25 refs.

Since 1955 the World Health Organization has played an active role in support of studies and advisory committees in the field of air pollution. A review of their activities is presented.

1246 APTIC NUMBER 12438

Bowles, Oliver
ASBESTOS - A MATERIALS SURVEY. Bureau of Mines Information Circ. 7880, 94p, 1959. 61 refs.
CFSTI, DDC: AD 640442

The present report on asbestos is a revision of a survey first published in 1952, the demand-supply position of asbestos in the United States. It includes information on production, imports, consumption, exports, capacity, interchangeability, substitutes, and possibilities for expansion. Price histories and trade figures are presented for the years 1935 or earlier to 1965. The properties of the commodity are described. Exploration, mining, milling, and processing methods are discussed. Included is an extended presentation of the structure of the industry covering major corporations, tranportation services, processing facilities, interrelationship to other industries, pertinent laws and taxation policies, tariffs, government controls, special labor problems, and the history of wartime controls. (Author forward modified)

1247 APTIC NUMBER 16878

Commoner, Barry
EVALUATING THE BIOSPHERE. Science J., 5A(4):67-72, Oct. 1969.

The biosphere--the earth's thin skin of air, water, and soil--provides the necessities of life for man. At the same time, the impact of man's technological developments has been felt increasingly by the biosphere. From an evaluation of some of the effects of modern technology on the biosphere, it is shown that technology as it is currently construed forms an intrinsically unstable relationship with the biosphere. Since the stability and integrity of the biosphere are essential for the continued operation of technology, the present situation represents a threat to the survival of our present system of technology, and, indeed, of man himself. A further discussion of this unstable relationship is presented.

1248 APTIC NUMBER 12322

Defense Documentation Center, Alexandria, Va.
AIR AND WATER POLLUTION BIBLIOGRAPHY, 1953 TO PRESENT. Vol. I, 556p., Oct. 1968. 294 refs.
DDC: AD-679210

Bibliography data, abstracts, and index terms for 294 unclassified references dating from 1953 are listed under the following headings: 1) air purification; 2) biological pollution other than biological warfare agents; 3) biological and chemical warfare agent pollution; 4) chemical pollution (exclusive of warfare agents); 5) confined environment contamination; 6) detection and measurement; 7) natural air pollution; 8) radiological pollution including radioactive fallout; 9) rocket exhaust and propellant; 10) water pollution and 11) water purification. Subject and author indexes are also provided. Volume II contains classified citations.

1249 APTIC NUMBER 18005

Hinch, Myles
AIR POLLUTION. J. Chem. Educ., 46(2):93-95, Feb. 1969. 4 refs.

The consideration of the air we breathe has been one of the most fundamental and profitable endeavors in scientific, philosophical, and medical thought. This is a discussion of the historical aspects of air pollution. Many of the specific substances that have been identified as air pollutants are discussed briefly.

1250 APTIC NUMBER 11759

RESEARCH INTO ENVIRONMENTAL POLLUTION. REPORT OF FIVE WHO SCIENTIFIC GROUPS. World Health Organ. Tech. Rept. Ser., no. 406, 83p., 1968.

Microchemical pollution of water systems and soil, biological estimation of water pollution levels, identification and measurement of air pollutants, long-term effects on health of new pollutants, and research into environmental pollution are discussed. Research into mutagenicity and carcinogenicity in relation to air, water and food pollution is described. Further necessary research is outlined. Greater efforts should be made to relate the kinds and amounts of pollutants from all types of environments with levels of pollutants and their metabolites in body tissues and fluids and with health effects in man and animals, using epidemiological and laboratory methods. Extrapolation of animal data to pollutant effects on man should be made more reliable. The body's defenses against low level pollutants and the related problem of adaptation should be studied. Increased attention should be devoted to the metabolism of absorbed pollutants and their effects on aging. More research should be done on substances suspected of having carcinogenic, mutagenic or teratogenic effects. Finally, industry should be encouraged to consider not only the utility and safety of new products, but also the likelihood of their contaminating the environment after use.

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SUBJECT INDEX

The terms listed in this subject index are those that most closely describe the information presented in the abstracts. Instead of the APTIC number, the NAPCA ABSTRACT BULLETIN (NAB) number is used to identify the abstracts. The NAB number is shown in the upper left corner of each abstract. This issue includes numbers 1 - 687, which are tabulated below to facilitate use of the index.

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